SCHEME OF INSTRUCTION AND EXAMINATION FOR B. PHARMACY - III YEAR IST SEMESTER

COURSE NO.	SUBJECTS	PERIODS/WEEK (50 Mts.)		MARKS	DURATION OF EXAM.	
		Theory	Practicals	Sessionals	Exams.	Hrs.
PYT.3.101	Medicinal Chemistry – I	4	--	30	70	3
PYT.3.102	Pharmaceutical Technology (Pharmaceutics – II)	4	--	30	70	3
PYT.3.103	Physical Pharmacy – I	4	--	30	70	3
PYT.3.104	Pharmacognosy – II	4	--	30	70	3
PYT.3.105	Pharmacology – I	4	--	30	70	3
PYP.3.106	Ph.armaceutical Technology (Pharmaceutics – II) Lab	--	4	25	50	4
PYP.3.107	Pharmacognosy Lab	--	6	25	50	4
PYP.3.108	Multimedia Aided Language Lab	--	4	25	50	4
		34		225	500	

SCHEME OF INSTRUCTION AND EXAMINATION FOR B. PHARMACY - III YEAR IIND SEMESTER

COURSE NO.	SUBJECTS	PERIODS/WEEK (50 Mts.)		MARKS	DURATION OF EXAM.	
		Theory	Practicals	Sessionals	Exams.	Hrs
PYT.3.201	Pharmaceutical Chemistry (Chemistry of Natural Products)	4	--	30	70	3
PYT.3.202	Pharmacology – II	4	--	30	70	3
PYT.3.20	Physical Pharmacy	4	--	30	70	3

3	**– II**					
PYT.3.204	**Forensic Pharmacy (Pharmaceutical Jurisprudence)**	**4**	**--**	**30**	**70**	**3**
PYT.3.205	**Biostatistics (Pharmacostatistics)**	**4**	**--**	**30**	**70**	**3**
PYP.3.206	**Pharmaceutical Chemistry (Chem. of Natural Products) Lab**	**--**	**6**	**25**	**50**	**6**
PYP.3.207	**Pharmacology Lab**	**--**	**4**	**25**	**50**	**4**
PYP.3.208	**Physical Pharmacy Lab**	**--**	**4**	**25**	**50**	**4**
		34		**225**	**500**	

MEDICINAL CHEMISTRY – I

Subject Code : PYT 3.101 **Sessional : 30**
Periods/week : 4 **Examination : 70**
Nature of Exam: Theory **Exam Duration: 3 Hrs**

Unit – I

Basic Considerations of Drug Activity

Physico chemical properties of drug molecules in relation to biological activity - Solubility, lipophilicity, partition-coefficient, Ionization, hydrogen bonding, Chelation, Redox potential and Surface activity. Bioisosterism and Steric features of drugs, drug distribution and protein binding; Introduction to Pro and Soft drug approach in drug design; Drug metabolism and factors affecting on drug metabolism

NOTE: Introduction, definition, nomenclature, chemical classification (other types of classification wherever relevant), structure, synthesis, general mechanism, mode of action (wherever known), SAR including physicochemical and stereo chemical aspects, metabolism and therapeutic uses of the drugs from each category shall be studied for the following units. An outline of synthetic procedure and metabolism of only the drugs, which are official as per Indian pharmacopoeia and British pharmacopoeia and mentioned in brackets against each category.

Unit – II

Adrenergic agents - (Isoproterenol and Salbutamol)

Adrenergic blocking agents - (Prazocin and Atenatol)

Cholinergic drugs and Acetyl Choline esterase inhibitors - (Carbachol, Physostigmine). Cholinergic blocking agents - (Pyridinium bromide and Dicyclomine HCI)

Ganglionic blocking agents and neuromuscular blocking agents -(Mecamylamine HCI and Pentolinium Tartarate). Skeletal muscle relaxants -Neuromuscular - (meprobromate)

Unit – III

Cardio Vascular Drugs - Anti-hypertensive drugs - (Captopril and Clonidine) Anti-arrhythmic drugs - (Verapamil, Nifedipine and Diltiazem),
Vasodilators - (Isosorbide dinitrate and Dipyridamole)
Anti- hyper lipidemic agents - (Clofibrate and Aterostatin)
Anti-platelet drugs - (Aspirin and Ticlopidine)
Cardiao tonic Agents - Synthetic analogs of cardiac glycosides

Unit – IV

Diuretics - (Acetazolamide and Furosemide, Hydrochlorthiazide and Amiloride).
Positive Inotropic Agents (Amrinone)
Hypoglycemic agents - (Tolbutamide and Glyclazide).

Thyroid agents, Anti-thyroid gents -. (Prophylthiouracil)
Immuno suppressants - (Azathioprine) and Immunostimulants -(Levamisole)

Unit – V

Anti-histaminics (HI & H2)-(Diphenhydramine, Chlorpheniramine, Citrizine, Ranitidine). Proton Pump Initiators (Omeprazole)

Coagulants and Anti-coagulants - (Warfarin)
Examination : One question from each unit with internal choice.

Text Books

1. J.H. Block &J.M. Beale (Eds) Wilson and Giswold's Text Book of Organic Medicinal & Pharmaceutical Chemistry, 11th Edn, Lippincolt, Raven, Philadelphia, 2004.

2. W.O. Foye, Text Book of Medicinal Chemistry, 5th edn, Lea & Febiger, Philadelphia, 2002.

3. S.N. Pandeya, Text Book of Medicinal Chemistry, 2nd edn, S. G. Pubn, Varanasi, 2003.

Reference Books

1. D. Abraham (Ed) , Burger Medicinal Chemistry and Drug Discovery, Vol.I , 6th edition, John Wiley & Sons, New York, 2003.
2. B.N. Lads, M.G. Mandel and F.I.Way, Fundamentals of drug metabolism & disposition, William & Welking Co, Baltimere.
3. C. Hansch, Comprehensive Medicinal Chemistry, Vol I-VI Elsevier Pergamon Press, Oxford, 1991.
4. Daniel Lednicer, Strategies for Organic Drug Synthesis & Design, John Wiley N.Y., 1998.
5. D. Lednicer , Organic Drug Synthesis, Vol. I-VI, John Wiley N.Y.

PHARMACEUTICAL TECHNOLOGY

(Pharmaceutics - III)

Subject Code: PYT 3.102 **Sessional : 30**
Periods/week: 04 **Examination : 70**
Nature of Exam: Theory **Exam Duration: 3 Hrs**

Unit – I

Formulations
Excipients
Properties and selection, Antioxidants, Preservatives, Colouring agents, Flavouring agents, Sweetening agents, Diluting agents, Vehicles, Surfactants, Hydrocolloids, Above Adjuvants should be studied with reference to FDA approvals and Drugs & Cosmetics Rules wherever applicable.
Capsules
Hard Gelatin Capsules: Advantages, Sizes, Storage, Printing, Formulation, Selection of sizes, Filling, Sealing, Cleaning and Polishing, Evaluation.
Soft Gelatin Capsules: Advantages, Applications, Formulation, Manufacture & Evaluation.

Unit – II

Suspensions and Emulsions
Suspensions: Formulation Types; Deffloculated and Flocculated suspensions, Formulation parameters; Methods of Manufacture and Evaluation.
Emulsions: Formulation Types, Formulation-parameters, Manufacturing Methods and Selection of equipment, Evaluation methods including the shelf life, Concepts of Multiple emulsions.

Unit – III

Tablets and Tablet Coating
Tablets: Types & Classes, Advantages and Disadvantages, Challenges in formulation and manufacture, Excipients in the formulation, Ideal requirements of Excipients, Granulation methods, Compression Machines, Processing problems in compression - Capping & Lamination, Picking & Sticking, Mottling, Weight variation, Hardness variation etc. Evaluation of Tablets.
Tablet Coating: Coating principles, General equipment, Sugar coating-steps, Compression coating, Film coating-steps, materials used in film coating, enteric coating, Film defects, Specialised coating techniques and Quality Control of Tablets

Unit – IV

Parenterals and Opthalmic Preparations
Parenterals: Definition, Classification and Types of Parenterals, Advantages and limitations, Preparation, Formulation, Containers, Production procedures & facilities, Environmental and other controls, Filling procedures, Products requiring Sterile Packing, Evaluation tests, Sterile powders, Emulsions, Suspensions.

Opthalmic Preparations: Requirements of Eye ointments, Eye drops, Formulation, Methods of preparation, containers, Evaluation and quality control.

Unit – V

Aerosols and Packaging Materials

Aerosols: Definition, Types, Advantages and Disadvantages; Propellants, General Formulation, Manufacturing and packing methods - Pharmaceutical Applications.

Packaging Materials: Glass, Plastics, Metal and Rubber, their influence on dosage form stability.

Examination: One question from each unit with internal choice.

Text Books

1. **L. Lachman, H.A. Lieberman and J.L. Kanig, Theory and Practice of Industrial Pharmacy, Varghese Publishing House, Mumbai, 3rd Edn, 1991.**
2. **Ansel's Phramceutical dosage forms and Drug delivery systems, 8th edn, 2004, Lippincott Williams & Wilkins, USA.**
3. **Micheal E Aulton, Pharmaceutics – The science of dosage form design, 1st edition, 1998, Churchill living stone.**

Reference Books

1. **A.R. Gennaro, Remington: The Science and Practice of Pharmacy, 20th Edition, Vol. 1, Lippincott Williams & Wilins, Philadelphia, 2004.**
2. **E.A. Rawlins, Bentely's Textbook of Pharmaceutics, 8th Edition, Baillere Tindill, London, 2002.**
3. **The Prevention of Food Adulteration Act 1954 with Rules.**
4. **Vijay Malik Drugs & Cosmetic Act 1940, 10th edition.**

PHYSICAL PHARMACY – I

Subject Code : PYT.3.103 **Sessional : 30**
Periods / Week: 4 **Examination : 70**
Nature of Exam: Theory **Exam Duration: 3 Hrs**

Unit – I

States of Matter and Phase Equilibria

Gaseous state: Ideal Gas law, Molecular Weight determination, Kinetic Molecular Theory and Vander-waals Equation for Real Gases;

Liquid state: Liquefaction of Gase, Methods of Achieving Liquefaction, Vapor pressure of Liquids, Boiling Point and Heat of Vaporization including Clausus – Claypeyron equation;

Solids and Crystalline state: Crystalline Solids --- X-ray diffraction, melting point and heat of fusion, Intermolecular forces, Polymorphism. Amorphous solids and Liquid crystalline state.

Phase equilibria: The phase rule; Systems containing one, two and three components, Rules relating to Triangular Diagrams; Solid dispersions;

Thermal Analysis: Differential scanning Calorimetry; Diffrential thermal analysis and Thermogravimetric and Thermochemical Analysis;

Physical properties of drug molecules: Refractive index & Molar refraction

Unit – II

Thermodynamics

Defintion of Thermodynamic Terms: Specific Heat, Sensible Heat, Latent Heat and Heats of Transition; Laws of Conservation of Energy; Meaning of Energy Balance and its importance and Inputs of Energy balance; Concept of Heat and Work;

First Law of Thermodynamics: Statement, Definition of Internal Energy, Enthalpy and Heat Capacity; Heat Capacities at constant Volume and Pressure and their relationship; Thermochemistry: Standard State Heats of Formation and Combustion; Standard Enthalpy of Formation – Hess's Law of Heat summation and its application; Heat of reaction at constant pressure and at constant volume; Enthalpy of neutralization; Bond dissociation energy and its calculations from thermochemical data;

The second and third laws of thermodynamics: Statements, Definiton of Entropy, Free energy and Gibbs Free Energy; Free Energy functions and applications.

Unit – III

Solutions of non-electrolytes: Properties, types of solutions and concentration expressions; Ideal and real solutions; Colligative properties and Mol. Wt. determinations.

Solutions of electrolytes: Arrhenius theory of electrolytic dissociation; Modern theory of strong electrolytes; Debye- Huckel theory; Coefficients for expressing colligativce properties – L value, Osmotic Coefficient and Osmolality.

Ionic equilibria: Acid-base equilibria – Ionisation of weak acids, weak bases, water and ampholytes, Sorensen's pH scale. Acidity constants – effect of ionic strength upon acidity constants, effect of temperature on ionic equilibria. Determination of Acidity constants.

Unit – IV

Buffered and Isotonic solutions: The Buffer equation – Common ion effect and the buffer equation for weak acid and its salt and a weak base and its salt; pH indicators; Factors influencing pH of buffer solutions; Measurement and calculating tonicity and methods of adjusting tonicity and pH; Buffer capacity and its calculations; Van Slyke equation; Influence of concentration on buffer capacity and maximum buffer capacity;
Buffers in Pharmaceutical and biological systems – in vivo biologic buffer systems
Drugs as buffers: Pharmaceutical buffers and their preparation, influence of buffer capacity and pH on tissue irritation, stability vs optium therapeutic response, pH and solubility.

Unit – V

Electro Motive Force and Oxidation-Reduction: Electrochemical cells, Types of Electrodes, measuring the EMF of cells, reference electrodes and standard potentials, electrometric determination of pH and specific ions; Hydrogen and glass electrodes, operation of pH meter, ion elective electrodes, Applications of Oxdn – Redn Potentials (Redox potentials) in pharmacy.
Catalysis: Defeinition of Catalysis and Catalyst; Types of Catalyst; Promoters and Inhibitors; Mechnism of Simple Catalytic Reactions; Factors affecting the catalyst and Catalysis;

Examination: One question from each unit with internal choice.

Text Books

1. Martin, J. Swarbrick & A. Cammarata, "Physical Pharmacy" Lea and Febiger, Philadelphia, III Edition, 1983.
2. C.V.S. Subrahmanyam, Essentials of Physical Pharmacy, Vallabh Prakashan, Delhi, 2005
3. Hougen and Watson k.M & ragatz r.A, Chemical Process principles, Part-I (Material and Energy Balances), 2nd Edition , New Age International

Reference Books

1. Physical Pharmaceutics, by Shoton & Ridgway, Oxford press, London.
2. A Text Book of Physical Chemistry, by S. Glasstone, Van Nostrand, New Delhi.
3. Physical Chemistry by Walter Moore.
4. Remington's Pharmaceuticals Sciences, ed A.R. Gennaro, Mack Publishing co., PA.
5. Basic principles and calculations in Chemical engineering by D.M Himmelblau, Prentice Hall Publications

PHARMACOGNOSY-II

Subject Code : PYT.3.104 **Sessional : 30**
Periods / Week: 4 **Examination : 70**
Nature of Exam: Theory **Exam Duration: 3 Hrs**

Systematic Phamacognostic study, which includes sources (Biological and Geographical) diagnostic characters, chemical constituents, chemical tests, uses, substituents and adulterants of the crude drugs mentioned in the following units. MICROSCOPICAL CHARACTERS OF ONLY THE DRUGS UNDERLINED SHALL BE STUDIED.

Unit – I

Alkaloids
Introduction, definition, classification, isolation, tests, chemical nature and uses of Rauwolfia, Vinca, Nuxvomica, opium, ipecac, belladonna, dattura, lobelia, vasaka, kurchi, ephedra, cinchona, colchicum, aconite, punemava, shankhupushpi, tobacco.

Unit – II

Glycosides
Introduction, Definition, Classification, Isolation, tests, chemical nature and uses of Senna, aloes, rhubarb, digitalis, squill, dioscoreia, liquorice, momordica, black mustard, ammi, psoralia, gentian, picrorriza, ashwagandha, gokhru, kalmegh, stropanthus, shatavari, brahmi, quassia, gymnema.

Unit – III

Phytopharmaceuticals
Chemistry, Tests, Isolation, Characterization and Estimation of Following Constituents 1. Sennosides from Senna 2. Caffine from tea 3. Cineole from eucalyptus oil
4. Quinine from cinchona 5. Carvone from dill 6. Tannic acid from myrobalan
7. Rutin, hesperidin from citrus fruits.
Introduction, definition, classification, isolation, tests, chemical nature and uses of Volatile Oils and Resins from following Plant Sources: Fennel, Clove, Cinamon, Gaultheria oil, Artemisia, Taxus, Capscium, Turmeric, Podophyllum, Guggul Asafoetida and Pyrethrum.

Unit – IV

Tissue Culture
History, introduction, callus culture, suspension culture, Immobilization of culture, single cell culture, organogenesis and embryo culture.
Production of secondary metabolites, biotransformation and clonal propagation, Significance and application of plant tissue culture.

Unit – V

Herbal Medicines
Herbal medicines in India, practice, regulations, Quality Control and Standardization of Raw Materials. Types of herbal formulations and products.

Some Traditional Plant Medicines as a source of New Drugs
Introduction to dosage form of Ayurveda - Aristavas, Asawas, Chumas, Bhasma, Leyhas, Ghritams, Rasayanam and Kashayams.

Examination: One question from each unit with internal choice.

Text Books

1. Trease and Evans, Pharmacognosy by W.C. Evans, Elseview Ltd., London, UK/ Vailliers Tindal Easbourn UK.
2. Pharmacognosy by C.K. Kokate, Nirali Publication, Pune.
3. Pharmacognosy by T.E. Wallis CBS publishers and Distributors, Delhi.

Reference Books

1. The Ayurvedic pharmacopoeia of India I-III Govt. of India, Ministry of Health and Family Welfare Dept. of Indian system of medicine and Homeopathy, New Delhi.
2. Herbal Drug Industry, Eastern publishers, New Delhi.
3. Natural Products by O.P. Agarwal Vol.I & II Goel publications, Meerut.
4. Text Book of Pharmacognosy by Brady & Taylor.
5. Tissue culture and plant science by street
6. An Introduction to plant Tissue culture by M.K. Razdan, Oxford & IBH publishing Co. Pvt. Ltd. – New Delhi & Calcutta.

PHARMACOLOGY-I

Subject Code : PYT.3.105 **Sessional : 30**
Periods / Week : 4 **Examination : 70**
Nature of Exam: Theory **Exam Duration: 3 Hrs**

Unit – I

General Principles of Pharmacology
Introduction, Nature and sources of drugs, Routes of administration of drugs. Concept of absorption, bioavailability, Drug distribution, Biotransformation and excretion drugs, Biological half-life and its significance. Mechanism of action including drug receptor Interactions and factors influencing them. Dose response relationship.

Unit – II

Pharmacology of Drugs Acting On ANS
Introduction, Transmission, Distribution and Functions of Drugs acting on Autonomic Nervous System: Cholinoceptor - Activating and cholinesterase inhibitory drugs, Cholinoceptor blocking drugs, Adrenoceptor - Activating and other sympathomimetic drugs, Adrenoceptor - Antagonist drugs.

Unit - III

Pharmacology of Drugs Acting On CNS
Introduction, Transmission, Distribution and Functions of Drugs acting on Central Nervous System: CNS Neuro transmitters; CNS Stimulants: Hypnotics and Anxiolytics; Antipsychotic Agents; Anti-epileptic Agents; Anti-depressants and Mood Stabilizers; Local Anesthetics; Analgesics and Non-steroidal anti-inflammatory agents; Pharmacological management of Parkinsonism and other movement disorders;

Unit – IV

Drugs Acting on Cardio Vascular & Respiratory System
General considerations, Pharmacology of drugs used in the treatment of congestive heart failure, Anti-arrythmics, Anti-hypertensives & Anti-hyperlipedemic drugs, Anti-anginals and Vasodilators. Drugs used in the therapy of shock.
Pharmacology of Drugs affecting Respiratory System: Drugs used in the treatment of disorders of Respiratory Function and Bronchial Asthma. Bronchodialators, Antitussives and expectorants

Unit – V

Drugs Acting on Renal and Gastro Intestinal System
Diuretics and anti-diuretics, Water and Electrolytic Balances and pH modifying agents. Pharmacology of purgatives/laxatives, Anti-diarrhoeals, Emetics and Anti-emetics. Drugs used in peptic ulcers.

Examination: One question from each unit with internal choice.

Text Books

1. Pharmacology and Pharmacotherapeutics, R.S. Satoskar and S.D. Bhandarker, Popular Prakashan, Mumbai.

2. Pharmacology, H.P. Rang, M.M. Dale & J. M. Ritter : Churchill Livingstone, 4th edition.

3. Basic and Clinical Pharmacology, 9th edition – Bertram. G. Katzung.

Reference Books

1. Essentials of Medical Pharmacology, K.D. Tripati, J. P. Brothers Medical Publishers.

2. Lewis's Pharmacology, by J. Crossland, Churchill Livingstone.

3. Pharmacological Principles of Medical Practice, by Krantz and Care, Williams and Wilkins co.

4. Goodman and Gilman's, The Pharmacological Basis of Therapeutics. J. G. Hardman and Lee E. Limbard, Mc. Graw Hill, Health professions Division.

PHARMACEUTICAL TECHNOLOGY PRACTICALS

(Pharmaceutics - II)

Subject Code: PYP 3.106 | **Sessional : 25**
Periods/week: 4 | **Examination : 50**
Nature of Exam: Practical | **Exam Duration: 4 Hrs**

List of experiments

Minimum 12 experiments of the following shall be conducted.

1. Determination of optimum concentration of suspending agent (tragacanth) required for maximum physical stability of calcium carbonate suspension.
2. Preparation, identification and physical stability evaluation of an emulsion.
3. Manufacture of Tablets sodium bicarbonate tablets IP (500 mg).
4. Manufacture of paracetamol tablets IP (500 mg)
5. Manufacture of ascorbic acid tablets IP (50 mg).
6. Manufacture of aspirin tablets IP (300 mg).
7. Manufacture of calcium lactate tablets IP (300 mg).
8. Evaluation of uncoated marketed tablets (in-process and quality assurance).
9. Evaluation of coated marketed tablets (in process and quality assurance).
10. Manufacture of aspirin hard gelatin capsules USP (300 mg).
11. Evaluation of marketed hard gelatin capsules.
12. Manufacture of ascorbic acid injection IP.
13. Manufacture of calcium gluconate injection IP.
14. Manufacture of nandrolone deconate injection IP.
15. Manufacture of dextrose intravenous infusion IP.
16. Manufacture of Ophthalmic preparation.
17. Preparation of emulsion with combination of emulsifying agents using HLB values concept.
18. Preparation of suspension using suitable suspending agent.
19. Manufacture of declofenac gel.
20. Preparation of Multiple emulsions.

Reference Books 1. Indian Pharmacopoeia, 2nd, 3rd and 4th Editions, The Controller of Publications, Delhi, 1966, 1985 and 1996.

2. British Pharmacopoeia, Office of the British Pharmacopoeial Committee, London, 1988.

3. British Pharmaceutical Codex, 11th and 12th Edns, The Pharmaceutical Press, London, 1994.

4. United States Pharmacopoeia, 23 and National Formulary 18, Asian Edition, US Pharmacopoeial Convention, Inc., New York, 1995.

5. D.P.S. Kohli, Drug Formulation Manual, Eastern Publishers, Delhi, 1991.

6. Hoover, Dispensing of Medication, 8th Edn, Mack Publishing Company, Pennsylvania, 1976.

7. C.V.S Subrahmanyam, J. Thimma Setty and G.C. Prabhu Shankar, Laboratory

Manual of Pharmaceutics, Vallabh Publications, New Delhi, 2006.

PHARMACOGNOSY PRACTICALS

Subject Code : PYP.3.107 **Sessional : 25**
Periods / Week: 4 **Examination : 50**
Nature of Exam: Practicals **Exam Duration: 4 Hrs**

List of Experiments

1. **Detailed Microscopical study (Transverse section) of following drugs (Any four)**
   (a) Rauwalfia (b) Cinchona (c) Senna (d) Liquolice (c) Fennel (f) Clove (g) Nux-Vomica.
2. **Microscopical powder characters of (Any eitht)**
   (a) Vasaka (b) Clove (c) Ephedra (d) Cinnamon (e) Liquorice (f) Digitalis (g) Quassia (h) Nuxvomica (i) Cinchona G) Coriander (k) Senna (1) Kruchi (m) Rauwolfia.
3. **Morphological Identification of drugs listed in theory.**
4. **Determination of swelling factor.**
5. **Determination of refractive index and optical rotation.**
6. **Isolation and Identification of starch from potatoes.**
7. **Isolation and Identification of Caffine from tea**
8. **Isolation of Tannic acid from Galls.**
9. **Estimation of cincole in encalyptus oil.**
10. **Distillation of volatile oils (Demo).**
11. **Qualitative Microscopical powder Analysis (Binary Mixture).**
12. **Determination of stomatal index, palaside ratio and number**
13. **Measurement of fibers and grains**

Reference Books

1. **K.R Khandelwal, Practical Pharmacognosy, Nirali Prakashan, Pune, 2002.**
2. **M.A. Iyengar, Study of Crude Drugs, Manipal Press Ltd, Manipal, 2004.**
3. **M.A. Iyengar, Pharmacognosy of Powder Crude Drugs, Manipal Press Ltd, Manipal, 2005.**
4. **M.A. Iyengar and S.G.K. Nayak, Anatomy of Crude Drugs, Manipal Press Ltd, Manipal, 2004.**
5. **C.K. Kokate, A.P. Purohit and B. Gokhale, Pharmacognosy, Nirali Prakashan, Pune, 2006.**
6. **Vinod D. Rangan, Pharmacognosy & Phylochamistry, Career Publication, Nashik, 2008.**
7. **Ashistosh Kar, Pharmacognosy & Phannacobiotechnology, New Age International Publishers, New Delhi, 2003.**

MULTIMEDIA AIDED LANGUAGE LAB

Subject Code : PYP.3.108 **Sessional : 25**
Periods / Week: 4 **Examination : 50**
Nature of Exam: Practical **Exam Duration: 4 Hrs**

Exercise Oriented Practicals

Exercise – 1
Writing Effective Headings; Writing Effective Passages - To describe; To compare and contrast; To define; To show cause and effect and To show sequence

Exercise – 2
Writing Grammatically Sound Sentence; Using the Right Tense and Voice - Using the active voice; Paring the passive; Writing in the third person and Using the imperative voice

Exercise – 3
Punctuating Effectively - Common punctuation marks and how to use them; Using punctuation to clarify messages and improve readability; Bullets, numbers, white space and Using symbols and abbreviations

Exercise – 4
Writing Summaries; Description – Event and Product

Exercise – 5
Writing Specific Documents - Letters and Memos; Job Applications, Cover letters and Resume;.

Exercise – 6
Writing - Procedures; Proposals and Analytical Reports;

Exercise – 7
Using of Graphs, Tables and Figures for representing a data

Exercise – 8
Writing out a talk; Extra verbal Cues; Handouts, Visuals and demonstration Models;

Exercise – 9
Basics of Web Page Design; Writing and Designing for World Wide Web;

Exercise – 10
Document Authoring and Maintenance; HTML Language and Electronic Publishing;

Exercise – 11
Designing and Writing for Multimedia

Exercise – 12
Personal and Group Communication: E-mail; Mailing Lists, News Groups and Pharmacy – Related Discussion Forums;

Exercise – 13
Phonetics and Spoken English – Rhythm, Intonation, Reading aloud, Accent difference between American, British and Indian English; International Varieties of English

Exercise – 14

Formal and Informal types of Speech; Elocution; Debating; Group Discussion; Brain Storming;

Exercise – 15

Collaborations of Health care providers using Network Technologies; Intranets, Software used for remote collaboration and Telemedicne

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PHARMACEUTICAL CHEMISTRY
(CHEMISTRY OF NATURAL PRODUCTS)

Subject Code :PYT 3.201 **Sessional : 30**
Periods/week : 4 **Examination : 70**
Nature of Exam: Theory **Exam Duration: 3 Hrs**

Unit – I
Poly Functional Natural Products

Carbohydrates: Introduction, Definition, Classification, Isolation, General Properties (including isomerism) and Pharmaceutical importance of Carbohydrates, Chemistry (Structme, Nomenclatme and Reactions) of glucose, fructose, sucrose, maltose, cellulose and starch.

Oils & Fats: Introduction, Definition, Classification, Isolation, General properties and Pharmaceutical importance of oils and fats. Chemistry (Structme, Nomenclature and Reactions) of Oils and Fats and analyse according to Pharmacopoeial methods

Unit - II
Amino Acids and Proteins

Introduction, Definition, Classification, Isolation, General properties and Pharmaceutical importance of mnino acids and their relationship to proteins and polypeptides.

Chemistry of Protein Hormones: Insulin, Oxytocins, Thyroxin and anti-thyroid drugs

Unit - III
Flavanoids and Terpenoids

Flavonoids: Somces, Uses, chemistry and General methods of structural determination (chemical & spectral analysis) of Amygdalin, arbution and quercetin

Terpenoids: Isoprene rule, Special Isoprene Rule for terpenes, General methods of isolation and. Chemistry of citral, menthol and cmnphor.

Unit - IV
Alkaloids - Purine and Xanthine Derivatives

Introduction, Definition, Occurrence, Classification, Isolation, General properties and Pharmaceutical importance of Alkaloids. General methods of extraction, structme elucidation and Chemistry (Structme, Nomenclatme and Reactions) of ephedrine, atropine, papaverine and quinine and also Caffeine and mic acid.

Unit - V
Steroids

Introduction, Definition, Occurrence, Classification, Isolation, General properties and Pharmaceutical importance of Sterols: colom reactions of cholesterol, stigmasterol, ergosterol. Importance & general concepts of bile acids. Steroidal saponins: Diosgenin and hecogenin. Androgens, Estrogens, Progestational agents, Steroidal contraceptives. Adrenocorticoids, Deoxycorticosterone, Cortisone, Prednisone, Aldosterone. Cardiac Glycosides of Digitalis other Cardiac drugs, Strophanthus and Squill.

Examination: One question from each unit with internal choice.

Text books

1. Organic Chemistry, Vol.II by I.L. Finar, The English Language Book Society, London.
2. Natural Products Vol.I & II by O.P. Agarwal Goel publications – Meerut.

Reference Books

1. R.T. Morrison and R.N. Boyd, Organic Chemistry, Allyn and Bacon, Ine., Boston
2. Burger's Medicinal Chemistry, M.E. – Wolff, Ed., John Wiley & Sons, New York.
3. F.G.Mann & B. Saunders, Practical Organic Chemistry Longamans Green & Co. Ltd., U.K
4. R. M. Acheson, An Introduction to the Chemistry of Heterocyclic Compounds, Interscience NY.

PHARMACOLOGY – II

Subject Code: PYT 3.202 **Sessional : 30**
Periods/week: 04 **Examination : 70**
Nature of Exam: Theory **Exam Duration: 3 Hrs**

Unit – I

Chemotherapy of Infections and Cancer
Basic Principles of Chemotherapy; Systemic Pharmacological study of Anti-bacterial, Antiviral, Anti-fungal, Anti-protozoal and Anti-helmenthic drugs; Cancer Chemotherapy

Unit – II

Pharmacology of Autocoids: Local Hormones
Anti-histamines: Histamine, Serotonim and ergot alkaloids; Vasoactive principles; Eicosanoids; Prostagladins, Thromboxanes, Leukotrines and related compounds. Nitric oxide, Donors and inhibitors. Para Drugs acting on blood and blood forming agents - Coagulants, Anti-coagulants, Haematinics (iron, vitamin-B12, Folic acid) and Thrombolytic Agents.

Unit – III

Pharmacology of Endocrine System
Systemic Pharmacological study of Pituitary Hormones, Sex Hormones, Oral Contraceptives, Oxytocics and Uterine relaxants; Pharmacology of thyroid and Anti-thyroid drugs, Insulin, Oral hypoglycemics, Glucagon and Adrenocortico steroids;

Unit – IV

Bioethics and Bioassay Of Some Selective Drugs
Principles of Bioethics, Bioethics of Animals used in Bioassay studies; Principles of Bioassays; Official Bioassays; Biological assay of anti-haemophilic fraction, Heparin sodium, Chorionic gonadotropin, Corticotropin, Insulin, Oxytocin, Vasopressin and Adrenaline; Biological assay of diptheria anti-toxin, anti-rabies vaccine, tetanus anti-toxin and old tuberculin vaccine;

Unit – V

Toxicology of Drugs and Clinical Pharmacology
Principles of Toxicology; Definition of Poison; General principles of treatment of poisoning with special reference to barbutirates, Opium and Organophosphorus toxicity;
Treatment of Poisoning for the following toxins: Methyl Alcohol, Heavy metals, Paracetamol and Digitalis
Introduction to Clinical pharmacology and Phases of clinical trials;

Examination: One question from each unit with internal choice.

Text Books

1. Essentials of Medical Pharmacology, K.D. Tripati., Jaypee Brothers Medical Publishers
2. Pharmacology and Pharmacotherapeutics., R.S.Saathoskar and S.D. Bandarkar., Popular Prakashan, Mumbai.,
3. Text Book of Pharmacology by Rang and Dale

Reference Books

1. Goodman and Gilman's: "The Pharmacological basis of Therapeutics" by Joel G. Hardman and Lee E. Limbard., Pergamon Press
2. Lewis's Pharmacology by J. Crossland., Churchil Livingstone Publications
3. Basic and Clinical Pharmacology by Katzung B.G., Prentice-Hall
4. Clinical pharmacology by Lanzence

PHYSICAL PHARMACY – II

Subject Code : PYT.3.203 **Sessional : 30**
Periods / Week: 4 **Examination : 70**
Nature of Exam: Theory **Exam Duration: 3 Hrs**

Unit – I

Solubility and Distribution Phenomena

Definitions, Expressions, Phase rule, Solvent - Solute interactions - polar solvents and semipolar solvents, Solubility of gases in liquids - effect of pressure and temperature, Salting out, Effect of chemical reactions, Solubility calculations. Solubility of liquids in liquids ideal and real solutions, Complete and partial miscibility, Influence of foreign substances, Three component systems, Dielectric constant and solubility. Solubility of solids in liquids Ideal and non ideal solutions solvation and association in solutions. Solubility of salts in water, Solubility of slightly soluble and week electrolytes, Calculating solubility of weak electrolytes as influenced by pH, Influence of solvents on the solubility of drugs, Combined effect of solvents. Distribution of solutes between immiscible solvents - Effect of ionic dissociation and molecular association on partition & extraction, Solubility and partition coefficients, Preservative action of weak acids in emulsions, Drug action and partition coefficients.

Unit – II

Chemical Kinetics

Rates and orders of reactions - Rate, order of reaction, Molecularly, Specific rate constant, Units of basic rate constants, Mathematical treatment of rates.

Apparent zero order kinetics. First order reactions. Second order reactions. Determination of order of a reaction. Elementary idea complex reactions. Specific and general acid base catalysis. Influence of temperature and other factors on reaction rates - Effect of solvents, Ionic strength, Dielectric constant, Catalysts and light. Decomposition and destabilization of medicinal agents against hydrolysis, Oxidation. Kinetics in the solid state. Accelerated stability analysis.

Unit – III

Interfacial Phenomena

Introduction, liquid interphases - Surface and interfacial tensions, Surface free energy, measurement of surface and interfacial tensions, Spreading coefficient. Adsorption at liquid interfaces - Surface active agents, Systems of hydrophilic - Lipophilic classification, Solubilization and detergency. Types of monolayer at liquid surfaces, applications of amphiphiles. Absorption at solid interfaces - Solid/Gas interface - Solid/Liquid interface. Electric properties of interfaces - Electric double layer, N emst and zeta potentials.

Unit – IV

Colloids and Micromeritics

Dispersed systems, Size and shape of colloidal particles - pharmaceutical application, Types - Lipophilic, Lipophobic and Association colloids, Comparison of properties of colloidal sols; Optical, Kinetic and Electric properties of colloids, Solubilization gels - Structure, Properties and Applications.

Particle size and size distribution - average particle size, particle size distribution, number and weight distributions, Particle number; Methods for determining particle size - optical microscopy, sieving, Sedimentation, Particle volume measurement, Particle shape and surface area, Methods for determining surface area - Absorption methods, Air permeability methods; Derived properties of powders - Porosity, Packing arrangements, Densities, bulkiness, Flow properties.

Unit – V

Rheology and Polymers
Rheology of Pharmaceutical Fluids: Newtonian and Non-Newtonian Systems;
Newtonian systems - Laws of flow, Kinematic viscosity, Effect of temperature.
Non newtonian systems - Plastic and Pseudoplastic dilatant flow.
Thixotropy - Measurement of thixotropy, Thixotropy in formulation.
Determination of rheologic properties - choice of viscometer, Capillary, falling sphere, Cup and bob, and cone and plate viscometers. Psychorheology. Applications to pharmacy.
Polymers: Definition, Types of Polymers, Water Soluble and Water Insoluble Polymers; Polymers as Thickening Agents; Pharmaceutical Application of Polymers;
Examination: One question from each unit with internal choice.

Text Books

1. A.N. Martin, Arthur Cammarata and J. Swarbrick, Physical Pharmacy by 3rd ed, K.M. Varghese & Co, Bombay.

2. C.V.S. Subrahmanyam, Textbook of Physical Pharmaceutics, 2nd Edition, Vallabh Prakashan, Delhi, 2004.

Reference books

1. Tutorial Pharmacy by Cooper & Gunn, ed S.J. Carter, CBS Publishers, Delhi.
2. Physical Pharmaceutics by Shotton & Ridgway, Oxford University press, London.
3. Remington's Pharmaceutical Sciences, ed A.R. Gennaro, Mack publishing Co, PA.

FORENSIC PHARMACY
(PHARMACEUTICAL JURISPRUDENCE)

Subject Code : PYT 3.204 | **Sessional : 30**
Periods/week : 04 | **Examination : 70**
Nature of Exam: Theory | **Exam Duration: 3 Hrs**

Unit – I

1. Evolution of Pharmaceutical and Drug Legislation in India.
2. The Pharmacy Act 1948.
3. Code of Pharmaceutical Ethics.
4. Consumer protection Act 1986.
5. Narcotic and Psychotropic substances Act 1985.

Unit – II

Drugs and Cosmetics Act 1940 and Drugs & Cosmetic Rules 1945 (also amendments).

1. Administration of the Act – The controlling and licensing regulation at state level and central level (the organisation, function and duties of state and central drug control authorities).
2. Drugs & Cosmetic Act Rules – the provisions related to
   a. The manufacture of drugs (other than homeopathic) including schedule C, C(1), F, F(1) and X drugs and cosmetics.
   b. The sale and distribution of drugs (other than homeopathic) including schedule C, C(1), F, F(1) and X drugs and cosmetics.

Unit – III

Drugs & Cosmetics Act Rules

1. (i.) The import and export of drugs & cosmetics.
   (ii) Labelling and packing requirements for all categories of drugs & cosmetics.
2. (i.) List of schedules to the Drugs & Cosmetics Rules.
   (ii.) Detailed study of schedule M (new), U and Y.
3. Medicinal & Toilet preparations (Excise Duties) Act 1955.

Unit – IV

1. Drugs and magic Remedies (Objectionable Advertisments) Act 1954.
2. Prevention of Food Adulteration Act 1954 (salient features)
3. The Factories Act 1948 and the Amendment (salient features.).

Unit – V

IPR's and Patent Laws

1. Intellectual Property Rights – a brief introduction to various IPR's.
2. Indian Patent Act 1970 and the Amendments to the Act (upto date with reference to WTO Agreement)
   a. Introduction & Objectives

b. Inventions and Not inventions according to the Act.
c. Procedure of obtaining patent for drugs and pharmaceuticals.

3. Drug Price Control Order (Latest).
4. Pharmaceutical Policy 2002.

Examination: One question from each unit with internal choice.

Text Books

1. Forensic Pharmacy by B.M. Mithal, Vallabh Prakashan.
2. Forensic Pharmacy by Dr. B.S. Kuchekar, A.M. Khadatare and Sachin C. Itkar, Nirali Prakashan, Pune.
3. Drugs and Cosmetics Act 1940 by Vijay Malik, Eastern Book Company, Lucknow.

Reference Books

1. Bare Acts, published by Govt. of India.
2. Patent Act 1970 with patent Rules , published by Taxman Allied services (P) Ltd., 59132, New Rohtak Road, New Delhi – 110005.
3. ISO, International Organisation for Standardisation, Switzerland, 1994.

BIOSTATISTICS
(PHARMACOSTATISTICS)

Subject code : PYT 3.205 **Sessional : 30**
Periods / week : 4 **Examination : 70**
Nature of exam: Theory **Exam Duration: 3 Hrs**

Unit – I

Definition and determination of terms Mean, Median, Mode, relation between mean, median, and mode. Standard deviation, histogram, Coefficient of correlation, regression analysis, curve fitting, theory of probability.

Unit – II

Nature and Scope of Statistical methods and their limitations, compilation, classification, tabulation and applications in pharma and life sciences; Graphical representation; Measures of Average Stem and Leaf Plots; Box and Whisker Plots, Co-plots; Introduction to Probability Theory and Distributions (Concepts without Derivations), Binomial, Poisson & Normal Distributions (Only definition and Problems)

Unit – III

Sampling Methods: Simple, Random, stratified, Systematic and Cluster Sampling Procedures; Data Collection, Data Organization and Data Representation; Bar, Pie, 2-D and 3-D Diagrams; Sampling and Non-Sampling Errors; Sampling Distributions; measure of dispertion.

Unit – IV

Interference Concerning Means: Point Estimation - Interval estimation - Bayesians estimation - Tests of Hypothesis; Common Parametric and Non parametric tests employed in testing of significance in biological/pharmaceutical experiments.

Unit – V

Tests of significance - T -test, chi-square test, analysis of variance, elements of Anova (one way and two way). Principles of scientific experiments; concept of CRD, RBD and Latin square diagrams.

Examination: One question from each unit with internal choice.

Text and Reference Books

1. **Probability and Statistics by M.R Spiegel Schaum Series**
2. **Biostatistics: A Foundation for analysis in Health Sciences, by Danial W.W., John Wiley**
3. **Statistics for Biologists, by Campbell, R.C., Cambridge University Press**
4. **Practical statistics for experimental Biologists, by Wardlaw, A.C., John Wiley and Sons Inc.,**

PHARMACEUTICAL CHEMISTRY PRACTICALS
(CHEMISTRY OF NATURAL PRODUCTS)

Subject Code : PYP 3.206 **Sessional : 25**
Periods/week : 4 **Examination : 50**
Nature of Exam: Practicals **Exam Duration: 4 Hrs**

List of experiments

1. **Qualitative analysis of carbohydrates**
2. **Qualitative analysis of proteins**
3. **Qualitative analysis of amino acids**
4. **Qualitative analysis of alkaloids**
5. **Qualitative analysis oftriterpenoids & steroids.**
6. **Determination of acid value**
7. **Determination of saponification value**
8. **Determination of peroxide value**
9. **Determination of iodine value**
10. **Estimation of Atropine**
11. **Estimation of Ephedrine.**

Reference Books

1. **I.L. Finar: Organic chemistry, Vol.2: Stereochemistry and the Chemistry of Natural Product, 6th Edition, Pearson Education, New Delhi, 2003.**
2. **O.P Agarwal, Organic Chemistry: Natural Product, Vol – I & II, 13th Edition, Goel Publishing House,. Meerut, 2006.**
3. **B.S Furniss, A.J Hannaford, PWG Smith and AR Tatchell, Vogel's Text book of Practical Organic chemistry, 5th Edition, Longman Singapore publishers, Singapore, 1996.**
4. **M.A Iyenger, Study of Crude Drugs, 12th Edition, Mainpal Press Ltd, Mainpal, 2004.**
5. **C B Powar and CB Chatwal, Biochemistry, 4th Edition, Himalaya Publishing House, Mumbai, 2003.**
6. **Indian Pharmacopoeia , Volume - I & II, Controller of Publications, Delhi,1996.**
7. **British pharmacopoea, 2008.**

PHARMACOLOGY PRACTICALS

Subject Code : PYP.3.207 **Sessional : 25**
Periods / Week: 4 **Examination : 50**
Nature of Exam: Practicals **Exam Duration: 6 Hrs**

List of Experiments

1. **An introduction to different equipments used in Pharmacology laboratory**
2. **Effect of routes of administration on the action of drugs.**
3. **Dose response curves of Acetyl cholins.**
4. **Demonstration of different types of antagonism on isolated tissue preparations.**
5. **Effect of different electrolytes or drugs on isolated forg's heart.**
6. **Effect of drugs on isolated frog rectus abdominus (any four drugs).**
7. **Bioassay of drugs by matching method**
8. **Bioassay of drugs by graphical (interpolation) method**
9. **Bioassay of drugs by three point and four point methods.**
10. **Effect of various drugs on isolated rabbit intestine / guinea pig ileum**
11. **Hypoglycemic activity of insulin in rabbit.**
12. **Effect of drugs on ciliary movement of frog's esophagus**
13. **Local anesthetic activity on Rabbit eye / Guinea pig! Frog's hind limb withdrawal (Demo).**
14. **Anti-psychotic effect by pole climbing apparatus (Demo)**
15. **To study the analgesic effect of narcotic analgesic by using tail-flic/hot-plate/acetic acid induced writing method. (demo)**
16. **Effect of drug on blood vessels**
17. **Antipyretic effect in rabbits.**

Reference Books

1. **S.K Kulkarni, Hand Book of Experimental Pharmacology, 3rd Edition, Vallabh Prakashan, Hilton and Company, Kolkata, 2005.**
2. **M.N Gash, Fundamentals of Experimental Pharmacology, 3rd Edition, Vallabh Prakashan, Hilton and Company, Kolkata, 2005.**
3. **K.K Pillai, Experimental Pharmacology, 1st Edition, CBS Publications & Distributors, Delhi, 2008.**
4. **R.K Goyal, Elements of Pharmacology, 13th Edition, B.S. Shah Prakashan, Ahmadabad, 2003.**

PHYSICAL PHARMACY PRACTICALS

Subject Code : PYP.3.208 **Sessional : 25**
Periods / Week: 6 **Examination : 50**
Nature of Exam: Practical **Exam Duration: 4 Hrs**

List of Experiments

Minimum 12 experiments of the following shall be conducted

1. **Determination of bulk density and flow properties of powders/ granules.**
2. **Determination of viscosity of liquids using Ostwald viscometer/ Redwood viscometer.**
3. **Determination of surface tension by stalagmometer method.**
4. **Determination of HLB of surfactant- Saponification method.**
5. **Determination of CMC of a surfactant-Drop count method using stalagmometer.**
6. **Ternary phase diagram for a three component system comprising of alcohol, water and benzene.**
7. **Determination of adsorption behavior of acetic acid on charcoal.**
8. **Determination of CST of Phenol-water system**
9. **Effect of sodium chloride on CST of phenol water system.**
10. **Determination of solubility- Heat of solution method.**
11. **Determination of first order reaction rate constant - Acid hydrolysis of ester.**
12. **Preparation of pharmaceutical buffer and determination of its buffer capacity.**
13. **Determination of second order reaction rate constant- Alkali hydrolysis of ester.**
14. **Determination of ionization constant by conductivity method/ distribution method.**
15. **Determination of distribution coefficient of benzoic acid in benzene and water.**
16. **Determination of particle size distribution - Microscopy.**

Reference Books

1. **C.V.S Subrahmanyam and S.G. Vasantharaju, Laboratory Manual of Physical Pharmacy, Vallabh Prakashan, New Delhi, 2005.**
2. **C.V.S Subrahmanyam and J. Thimma Setty, Laboratory Manual of Physical Pharmaceutics, Vallabh Prakashan, New Delhi, 2002.**
3. **Manavalan. Ramasamy, Physical Pharmaceutics, Vignesh Publishers, Chennai, 2004.**

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