Third B.Pharmacy Prospectus No. 2015146
Semester-V Examination - Winter-2014,
Semester-VI Examination - Summer-2015

संत गाडगे बाबा अमरावती विद्यापीठ
SANT GADGE BABA AMRAVATI UNIVERSITY

आयुर्विज्ञान विद्याशाखा
(FACULTY OF MEDICINE)

PROSPECTUS
OF
THE DEGREE OF
BACHELOR OF PHARMACY (FOUR YEAR ï
EIGHT SEMESTER DEGREE COURSE)
SEMESTER-V EXAMINATION, WINTER-2014
SEMESTER-VI EXAMINATION, SUMMER-2015

2014

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Published by
Dineshkumar Joshi
Registrar,
Sant Gadge Baba
Amravati University
Amravati - 444 602

I N D E X
Third B.Pharmacy (Semester-V & VI)
(Prospectus No.2015146)

SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI
% ORDINANCE NO. 42 OF 2005

Examination in Environmental Studies leading to Bachelor Degree, Ordinance, 2005

Whereas it is expedient to frame an Ordinance relating to Examination in Environmental Studies leading to Bachelor Degree level, hereinafter appearing, the Management Council is hereby pleased to make the following Ordinance.

1. This Ordinance may be called ñExamination in Environmental Studies leading to Bachelor Degree, Ordinance, 2005.ò

2. This Ordinance shall come into force from the Academic session 2005-06.

3. In this Ordinance and in other ordinances relating to the examination, unless there is anything repugnant in the subject or context :-

(i) ñAcademic sessionò means a session commencing on such date and ending with such date of the year following as may be appointed by the Management Council.

(ii) ñAdmission to an examinationò means the issuance of an admission card to a candidate in token of his having complied with all the conditions laid down in the relevant ordinance, by a competant officer of the University.

(iii) ñApplicantò means a person who has submitted an application to the University in the form prescribed for admission to an examination.

(iv) ñCandidateò means a person who has been admitted to an examination by the University.

(v) ñRegular Candidateò means an applicant who has applied for admission to a Univeristy examination through an affiliated college, Department or Institute in which he/she has prosecuting a regular course of study.

(vi) ñExamineeò means a person who present himself/herself for an examination to which he/she has been admitted.

(vii) ñExaminationò means an examination prescribed by the University under the relevant Ordinance.

(viii) ñExternal Candidateò means a candidate who is allowed to take a University examination in accordance with the provision of Original Ordinance No. 151.

(ix) ñ Non-Collegiate Candidateò means a candidate who is not a collegiate candidate.

(x) An ñEx-studentò is a person who having once been admitted to an examination of this University, is again required to take the same examination by reason of his failure or absence thereat and shall

% As amended vide Ordinance Nos.7 of 2006 and 10 of 2007

include a student who may have joined a college, Department or Institute again in the same class.

(xi) ñBachelor Degree Examinationò means a examination leading to Bachelor Degree of the University.

(xii) ñPrevious Yearò means a year following by final year of Bachelor Degree.

4. Save as otherwise specifically provided, the conditions prescribed for admission to the examination under this Ordinance shall apply to all persons who wish to take the examination to the Degrees of the University mentioned in para 5 below.

5. The conditions prescribed for admission to examination under this Ordinance shall apply to following degrees of the University :-

1) Bachelor of Arts
2) Bachelor of Performing Arts
3) Bachelor of Fine Arts
4) Bachelor of Mass Communication
5) Bachelor of Social Work
6) Bachelor of Commerce
7) Bachelor of Business Administration
8) Bachelor of Science
9) Bachelor of Computer Science
10) Bachelor of Computer Applications
11) Bachelor of Pharmacy
12) Bachelor of Science (Home Science)
13) Bachelor of Technology (Cosmetics)
14) Bachelor of Engineering
15) Bachelor of Engineering (Part Time) (Civil)
16) Bachelor of Textile
17) Bachelor of Technology (Chemical Technology)
18) Bachelor of Technology (Chemical Engg.)
19) Bachelor of Architecture, and
20) Bachelor of Laws (Five Year Course)

6 i) Environmental Studies shall be a compulsory subject for a previous year examination of the following Bachelor Degrees of the University,

1) Bachelor of Arts
2) Bachelor of Performing Arts
3) Bachelor of Fine Arts
4) Bachelor of Mass Communication

5) Bachelor of Social Work

6) Bachelor of Commerce

7) Bachelor of Business Administration

8) Bachelor of Science

9) Bachelor of Computer Science

10) Bachelor of Computer Applications

11) Bachelor of Pharmacy

12) Bachelor of Science (Home Science)

13) Bachelor of Technology (Cosmetics)

14) Bachelor of Engineering (Part Time) (Civil)

ii) Environmental Studies shall be a compulsory subject for IIIrd & IVth Semester of the following Bachelor Degrees of the University,

1) Bachelor of Engineering

2) Bachelor of Textile

3) Bachelor of Technology (Chemical Technology)

4) Bachelor of Technology (Chemical Engineering)

5) Bachelor of Architecture, and

iii) Environmental Studies shall be a compulsory subject for Vth & VIth Semester of the Degree of Bachelor of Laws (Five Year Course)

iv) Students admitted to Second Year/Third Year/IVth Semester Vth Semester of various degree examination courses in different faculties n the academic session 2005-06 or thereafter shall have to appear for examination in the subject Environmental studies.

7. The main Examination leading to Environmental Studies shall be held in Summer and Supplementary examination in Winter every year, at such places and on such date as may be appointed by the Board of Examinations.
Explanation :- Examination shall be conducted on the basis of one common question paper for all Bachelor Degree examination courses irrespective of annual or semester pattern.

8. Scope of the subject for annual pattern examination and or semester pattern examination shall be as provided under the syllabus.

9. Common question paper for all courses covered under this Ordinance alongwith answer books shall be supplied by the University to the Colleges, Departments and Institutes for conducting the examination of the subject.

10. Valuation of the answer books relating to this subject shall be done at College/Department/Institution level only. Remuneration for valuation of answer books shall not be paid by the University.
Provided that prescribed evaluation fee for evaluation of each answer Book/s of an external examinee/s appeared from the examination centre shall be paid to each examination centre.

11. It shall be obligatory on the part of the College/Department/Institute to submit candidate wise following information to the University on or before the date as may be prescribed by the University :-

Sr. No.	Grade/Category	Marks secured
1.	ñAò	- 60 and above
2.	ñBò	- 45 to 59
3.	ñCò	- 35 to 44
4.	ñDò	- 25 to 34
5.	ñFailò	- 24 and below
6.	ñAbsentò	

12. For the purposes of teaching, learing and examination, the Committee consisting of three teachers shall be appointed by the Principal/ Head of the Department/Head of the Institution under his/her Chairmanship/ Chairpersonship. While appointing three teachers on the said committee, the Principal shall take care that the teachers to be appointed on the committee, if necessary, shall be from different faculty.

13. i) Duration of theory examination of this subject shall be three hour.
ii) For all Bachelor Degree examinations, common question paper of 100 marks shall be provided by the University.
iii) Distribution of these 100 marks shall be as follows :-

a) Part-A, Short Answer Pattern -25 Marks

b) Part-B, Essay type with inbuilt choice -50 Marks

c) Part-C, Essay on Field Work -25 Marks

14. Medium of instruction shall be English or Marathi or Hindi. Question paper shall be supplied in English and Marathi and Hindi. A candidate shall have option to write answers in English or Marathi or Hindi.

15. Examination for the subject Environmental Studies shall be compulsory for external candidates appearing as a fresh candidate at Winter and/or Summer examination.

16. For teaching of the subject, there shall be atleast two hour per week. For teaching the subject to the regular candidates, a full time approved teacher of the University and or a person having Postgraduate Degree in any faculty with second class shall be considered elligible.

17. For teaching of the subject, additional fee to be charged to regular candidate shall be as prescribed by the University.

18. Every College/University Teaching Department shall Charge addtional fee of Rs. 100/- to every student of the subject Environmental Studies. Out of this Rs.100/-, the College/University Teaching Department shall have to pay Rs.25/- to the University as an examination fee of each candidate for the subject Environmental Studies.

19. The Grade secured by an examinee in the examination of this subject shall not be considered for providing the facility of A.T.K.T. in next higher class.

20. The provisions of Ordinance No. 18/2001 shall not be applicable for securing a grade or higher grade in the examination of this subject.

21. Result of the Final Year of the respective Degree shall not be declared of an examinee unless he/she secures any one of the grade in the examination of subject.
Provided an examinee admitted to Five Year LL.B. course desiring not to continue his/her education beyond Sixth Semester of the said course shall have to secure any one of the grade in the examination of the subject otherwise his/her result of Sixth Semester for awarding B.A. degree shall not be declared.

22. Certificates shall be issued, to the successful examinees in the subject Environmental Studies, after the examination.

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Syllabus Prescribed for B. Pharm. Semester –V
(Introduced from the Academic Session 2012-13)

SEMESTER-V

Subject Code	Subject	Maximum Marks (Credits)		Total Marks (Credits)
		Theory	Practical	
5.1.	Pharmaceutics-III	80 (04)	80 (04)	160 (08)
5.2.	Medicinal Chemistry-I	80 (04)	80 (04)	160 (08)
5.3.	Pharmaceutical Organic Chemistry-III	80 (04)	80 (04)	160 (08)
5.4.	Pharmacognosy-III	80 (04)	80 (04)	160 (08)
5.5.	Pharmacology-II	80 (04)	80 (04)	160 (08)
5.6.	Biopharmaceutics-I	80 (04)	ð -	80 (04)
	Total			880 (44)

\Subject code: T-5.1

Subject : Pharmaceutics – III

THEORY **45 Hours (3 hrs. /week)**

SECTION-A

1. Preformulation studies:

a) Study of physical properties of drugs like physical form, particle size, shape, density, wetting, dielectric constant, solubility, dissolution, organoleptic property and their effect on formulation, stability and bioavailability.

b) Study of chemical properties of drugs like hydrolysis, oxidation, reduction racemisation, polymerisation etc. and their influence on formulation and stability of products.

c) Stabilization and stability testing protocol for various pharmaceutical products.

2. **Drug Regulatory affairs & NDA.**

3. **Liquid dosage forms :** Introduction Types of additives used in formulations, vehicles,stabilizers,preservatives, suspendingagents, emulsigying agents, solubilizers, colors, flavors, manufacturing, packaging and evaluation of clear liquids, suspension and emulsion.

SECTION-B

4. **Semisolid dosage forms :** Types, mechanism of drug penetration, factors influencing penetration, semisolid bases and their selection; general formulations of semisolids and gels manufacturing procedure, evaluation and packaging.
5. **Pharmaceutical aerosols :** Various propellants and valves, general formulations. manufacturing, packaging and evaluation methods, pharmaceutical applications.
6. **Ophthalmic preparations:** Requirements, formulations, methods of preparation, containers, evaluation.

Subject code: P-5.1

Subject : Pharmaceutics – III

PRACTICAL **45 Hours (3 hrs. /week)**

1. Preformulation studies including drug-excipient compatibility studies, effect of stabilizers, preservatives etc. in dosage form design.
2. Preparation, evaluation and packaging of liquid orals like solutions, Syrups, suspensions and emulsions, ointments, creams, suppositories, eye drops, eye ointments etc.

Recommended Books:

1) Ansel H.C., Introduction to Pharmaceutical Dosage Forms, K M Varghese & Co., Bombay.
2) Aulton M E Pharmaceutics - The Science of Dosage Form Design, ELBS/Churchill Livingstone.
3) Avis K E, Lachman L and Lieberman H A, Marcel Dekker Inc. Pharmaceutical Dosage Forms; Parenteral Medications, Vols. 1 & 2, NY.
4) Lachman L, Liberman H.A. & Kanig J.L., ñThe Theory & Practice of Industrial Pharmacyò, Lea & Febiger, Philadelphia.
5) Banker G S and Rhode C T Modern Pharmaceutics, Marcel Dekker Inc., NY.
6) Bean H S, Beckett A H, and Carless A H Advances in Pharmaceutical Sciences, Vol 1-4 Academic Press, London.
7) Carter S J, Cooper and Gunnôs Dispensing for Pharmaceutical Students, CBS Publishers, Delhi.
8) Carter S J, Cooper and Gunnôs Tutorial Pharmacy CBS Publishers, Delhi.
9) Remingtonôs, the science and Practice of Pharmacy, Mack Publishing Co. Easton, Pernsybrania.

Subject code: T-5.2

Subject : Medicinal Chemistry-I

THEORY **45 Hours (3 hrs. /week)**

Section A

1. **Basic principles of medicinal chemistry:**

   Physico-chemical aspects (optical, geometric and bioisosterism) of drug molecules and biological action. Drug-receptor interaction including transduction mechanism

2. **Drug metabolism:**

   Phase I and phase II reactions, biological factors affecting drug metabolism, inducers and inhibitors of drug metabolism, significance of drug metabolism in medicinal chemistry, principles of prodrug design

Section B

3. **History, development, classification, recent development, mode of action (biochemical and molecular basis wherever applicable), SAR, IUPAC and synthesis of drugs of following classes**

   Sympathomimetic agents including biosynthesis and metabolism of adrenergic neurotransmitters, adrenoreceptor blockers, cholinergic agents, cholinesterase inhibitors, anticholinergic agents including antispasmodics, ganglionic stimulants and blockers, neuromuscular blockers

Subject code: P-5.2

Subject : Medicinal Chemistry –I

PRACTICAL **45 Hours (3 hrs. /week)**

1) Laboratory scale preparation by conventional / microwave synthesis of selected drugs from course content and characterization by melting point / boiling point / thin layer chromatography / ultra-violet spectroscopy / IR spectroscopy
2) Establishing the pharmaceutical standards of drug synthesized

Books Recommended

1. J. N. Delagado and W. A. R. Remers, Eds, Wilson and Giswoldôs Textbook of Organic, Medicinal and Pharmaceutical Chemistry, J. Lipponcott Co. Philadephia.
2. W. C. Foye, Principles of Medicinal Chemistry, Lea & Febiger, Philadelphia.

3. H. E. Wolff, Ed. Burgerôs Medicinal Chemistry, John Wiley & Sons, New York Oxford University Press, Oxford.
4. Daniel Lednicer, Strategies for Organic Drug Synthesis & Design, John Wiley & sons, USA.
5. B. N. Ladu, H. G. Mandel & E. L. Way, Fundamental of Drug Metabolisum & Disposition, William & Wilkins co., Baltimore.
6. I. L. Finar, Organic Chemistry, Vol. I & II, ELBS/ Longman, London.
7. Vogelôs Text book of Practical Organic Chemistry, ELBS/ Longman, London
8. Mann & Saunder, Practical Organic Chemistry, Orient Longman, London.
9. Shriner, Hermann, Morrill, Curtin & Fuson, The Syntematic Identification of Organic Compounds, John Wiley & Sons. USA.
10. R. M. Silverstein, G. Claytron Basselôs, T. C. Movvill, Spectormetric identification of Organic compounds, John Wiley & Sons, USA

Subject code: T-5.3
Subject : Pharmaceutical Organic chemistry – III
THEORY 45 Hours (3 hrs. /week)

Section-A

1. Chemistry of Heterocyclic Compounds

Structures & numbering & corresponding drugs of the following Heterocyclic compounds: Furan, Thiophene, Pyrrole, Pyrazole, thiazole, imidazole, oxazole, isoxazole, hydantoin, pyridine, pyridazine, pyrimidine, indole, benzyl furan, benzylthiazole, benzimidazole, benzoxazole, quinoline, isoquinoline, quinazoline, cinnoline, purine, xanthine, pteridine, Coumarin; Synthesis and Reaction of following compounds: furan, thiophene, pyrrole, indole imidazole, thiazole, pyridine, quinoline and isoquinoline.

2. **Organic Synthesis by Retro Synthesis**

Introduction to common terms. Disconnections involving one and two functional groups, Rules of disconnection, The retro-synthesis of following drugs be covered: Ibuprofen, Propranolol, Losartan, Ciprofloxacin and Sulfamethoxazole.

3. **Introduction to Combinatorial Chemistry**

History, Multiple Parallel Synthesis, Chemistry and equipments, Mixture synthesis Strategies including solid supported synthesis, Deconvolution methods.

Section-B

4. Chemistry of Carbohydrates

Introduction, Classification and reactions of C5 and C6 sugars and cyclic structures/glycosides. Mutarotation, Establishment of structures of monosaccharides, disaccharides and starch by chemical methods.

5. **Chemistry of Proteins & Amino Acid**

Methods of peptide synthesis- solution and solid phase peptide synthesis (up to pentapeptide), Structure of natural amino acids, isoelectric point. Methods of preparation of amino acids. Peptide bonds, structures of some biologically and medicinally important simple peptides. Proteins, Classification and function. Denaturation, structure of proteins, conjugated proteins, secondary structure of proteins.

6. **Molecular Rearrangements- Mechanism, Stereochemistry & Example (at least two examples)**

a) Rearrangement of electron deficient systems

General Theory. Whitmore-1, 2-shift, Wagner-Meerwein rearrangement, Piancol rearrangement, Wolf rearrangement, Beckmann rearrangement, Hofmann rearrangement, Lossen rearrangement, Curtius rearrangement, Schmidt rearrangement, Baeyer-Villiger Oxidation.

b) Electron-rich rearrangements

Stevens rearrangement, Wittig rearrangement, Neber reaction, Benzillic acid rearrangement, Dakin oxidation, Sommelet rearrangement, Favourskii rearrangement.

c) Migration of Aromatic rings

Fries rearrangement, Claisen rearrangement, Willgerodt reaction, N-Halormide rearrangement.

d) Migration involving double and triple bonds

Cope rearrangement.

7. **Mechanism of following name reaction with example (at least two examples)**

Aldol Condensation, Allan-Robinson reaction, Arndt-Eistert Synthesis, Algar-Flynn-Oyamada Reaction, Birch Reduction, Cannizzarro Reaction, Chichibabin Reaction, Claisen Condensation, Diels-Alder Reaction, Mannich Reaction, MPV Reduction, Michael Reaction, Oppenauer Oxidation, Reformatsky Reaction, Woiff-Kishner Reduction, Wurtz Reaction.

Subject code: P-5.3

Subject : Pharmaceutical Organic Chemistry –III

PRACTICAL **45 Hours (3 hrs. /week)**

1. Synthesis of some heterocyclic compounds
2. Quantitative determination of reactive groups, nitro, hydroxyl, primary and secondary amines, esters, amides and carbonyl.
3. Synthesis of some organic compounds based on name reactions.
4. Synthesis of some organic compounds using green chemistry approach.

Recommended Books

1. Advanced Organic Chemistry by E.S. Gould, 4/Ed. Wiley Eastern Edition.
2. Principles of Organic Synthesis by Norman, 3/Ed., Nelson Thorns Publication.
3. Organic Chemistry by Morrison & Boyd, 7/Ed, Pearson Education.
4. Heterocyclic Chemistry by Joule and Mill, 4/Ed., Blackwell Publishing Oxford.
5. Organic Chemistry by Fieser & Fieser, Vol. I-X, 1/Ed. Asia Publishing House.
6. Modern Hetrocylic Chemistry By Leao Payrettee.
7. Organic Synthesis- The disconnection approach by Stuart Warren, John Wiley & Sons.
8. Vogelôs Textbook of Practical Organic Chemistry by A. I. Vogel, 5/Ed., Pearson Education.
9. Handbook of Organic Analysis (Qualitative and Quantitative) by H. T. Clarke, 1/Ed. Arnold-Heinemann.
10. Textbook of Practical Heterocyclic Chemistry by Fitten and Smalley.
11. Synthesis of Drugs-Synthone approach Vol. 1, by Radhakrishnan Ayer, J. R. Rao,
12. M. S. Degani, S. A. Ghone, K. Mohanraj, 2/Ed, 2008, Sevak Publication Pvt. Ltd.
13. Quantitative organic Analysis by Siggsa & Honna, 4/Ed., A Wiley Interscience Publication. John Wiley & Sons.
14. Organic Synthesis, Vol. I to X, John Wiley & Sons Ins. New York.

Subject code: T-5.4

Subject : Pharmacognocy-III

THEORY **45 Hours (3 hrs. /week)**

SECTION-A

1. Microscopy: Study of plant cell inclusions, reactions of cell walls, cell contents, clearing agent, macerating reagents. Plant tissues. Micromerty, Leaf constants, trichomes, powdered microscopy. Quantitative microscopy as applied drugs evaluation and procedures of microtome sectioning procedure, preparations of biological materials for examination by electronic microscope.
2. Common Poisonous Plants of India
3. Marine Pharmacognsy: Novel medicinal Agents from marine sources.
4. Detailed study of plant Biochemistry, Study of techniques employed in the elucidation of Biosynthetic pathways and the study of important Biosynthetic pathways of plants like photosynthesis, Carbohydrate utilization, Aromatic Biosynthesis, shikimic acid pathway, Isoprenoid pathway, Biosynthesis of tropane, quinoline, hopane, quinidine, opium and indole alkaloids. Biosynthesis of steroidal and antraquinone glycosides.

SECTION-B

5. Glycosides: Definition, general characters and classification, occurrence, general method of isolation and estimation. Study of the biological sources, cultivation, collection, commercial varieties, chemical constituents, substitutes, adulterants, uses, diagnostic macroscopic and microscopic features and specific chemical tests for identification of following drugs containing glycosides:
   a) Saponins: Liquorice, ginseng, dioscorea, sarsaparilla and senega.
   b) Cardioactive sterols: Digitalis, squill, strophanthus and thevetia.
   c) Anthraquinone cathartics: Aloe, senna, rhubarb and cascara.
   d) Others: Psoralea, Ammi majus, Ammi visnaga, gentian, saffron, chirata, quassia, citrus bioflavonoids (Lemon and Orange peels), Solanaceous species aswagandha.
6. Introduction, classification and study of different chromatographic methods and their applications in evaluation of herbal drugs.

Subject code: P-5.4

Subject : Pharmacognocy-III

PRACTICAL **45 Hours (3 hrs. /week)**

1. Morphological, Histological, Microchemical and chemical study of-Cinnamon.
2. Morphological, Histological, Microchemical and chemical study of-Clove.

3. Morphological, Histological, Microchemical and chemical study of- Ephedra.
4. Morphological, Histological, Microchemical and chemical study of- Fennel
5. Morphological, Histological, Microchemical and chemical study of- Ginger
6. Morphological, Histological, Microchemical and chemical study of- Ipecac
7. Morphological, Histological, Microchemical and chemical study of- Nux-vomica
8. Morphological, Histological, Microchemical and chemical study of- Quassia
9. Morphological, Histological, Microchemical and chemical study of- Senna.
10. Morphological, Histological, Microchemical and chemical study of- Coriander
11. Morphological, Histological, Microchemical and chemical study of- Vinca leaf
12. Identification of powdered crude drugs and their combinations with the help of organoleptic, microscopic, micro-chemical and chemical methods. (Minimum 5 Expt.).
13. Few exercises on isolation of active principles from crude drugs.
14. Establishment of thin layer chromatographic profiles of some volatile oils and extracts containing alkaloids and glycosides.
15. Spotting of crude drugs mentioned in theory
16. Successive extraction and qualitative test for different extract.
17. Thin layer chromatographic study of different natural products.

Recommended Books

1. Pharmacognosy by G.E. Trease, W.C. Evans, ELBS.
2. Pharmacognosy by Varro E.Tyler, Lynn. R.Brady, James E.Robbers.
3. Text Book of Pharmacognosy by T.E. Wallis, CBS Pub. Delhi.
4. Plant Physiology of Frank B.Salisburry, Cleon. W.Ross, CBS Pub. Delhi
5. Diosgenin and other steroid drug precursors by Asolkar,CSIR.
6. Antibiotics,Isolation&Seperationby Weinsted.M.I.Wagman,G.H.
7. Hormone Chemistry by W.R.Butt.
8. Quantitative analysis & Steroids by Gorog.S.
9. Steroids by Feiry & Feisher.
10. Alkaloids Chemical & Biological by S.W.Pelletier.
11. Biotechnology of Industrial antibiotics by E.vardemme.
12. Chromatography of Alkaloids by Vapoorte, Swendson.
13. Elements of chromatography by P.K.Lala.
14. Introduction to chromatography theory & Practicals by V.K. Srivastava, K.Kishore.

15. Principles of Biotechnology by Leininger.
16. Jenkins Quantitative Pharmacuetical Chemistry by A.N.Knevell.
17. Handbook of vitamins by L.J.Machlein.
18. Clerkôs Isolation & Identification of drugs by A.C.Mottal.
19. Selected Topics in Exp-Pharmacology by Seth.V.K.
20. Burgerôs Medicinal Chemistry by wolff.M.I.
21. Wilson & Gisvolds Text Book of organic Medicinal and Pharmacuetical Chemistry by Deorge.R.F.
22. Phytochemical methods of chemical analysis by Harbone.
23. Organic chemistry vol.II by I.L.Finar.
24. The Essential oil by Gunther.E.
25. The use of Pharmacological techniques for the evaluation of natural products by B.N.DhavanR.C.Srimal. CDRI, Lucknow.
26. Physical methods in organic chemistry by J.C.P.Schwartz.
27. Techniques in organic chemistry by Weiss Creger.
28. Practical Pharmacognosy by Dr.C.K. Kokate.
29. Practical Pharmacognosy by Dr.P.K.Lala.
30. Herbal medicines ï Janne Barnes, Linda. A.Anderson.
31. Chinese materia medica ï Yaru ï PingZhu.
32. Natural products from plants ï Peter.B.Kanfman.
33. Selection, Preparation and pharmacological evaluation of plant material, M.Williamson, DT.Okpako.

Subject code: T-5.5

Subject : Pharmacology-II

THEORY **45 Hours (3 hrs. /week)**

SECTION-A

1. **Pharmacology of Autacoids and their antagonists:** Histamine and antihistamines, 5-hyrroxytryptamine and its antagonists, drug therapy for migraine, Prostaglandins, leukotrienes (eicosanoids), platelet activating factors, Plasma Kinins, Angiotensin.
2. **Chemotherapy:** Introduction- Molecular basis of Chemotherapy and drug resistance. General classification of drugs, mechanism of action, Pharmacokinetics, adverse reactions, drug interaction, pharmacological uses of Sulfonamides and Co ï trimoxazole, Penicillins and Cephalosporins, Tetracycline and Chloramphenicol, Macrolides, Amino glycosides, Polyenes and Polypeptide antibiotics, Quinolones and Fluoroquinolones, Chemotherapy of Tuberculosis and Leprosy Antifungal antibiotics, Anthelmentics drugs, Chemotherapy of Protozoal infections- Malaria, Amoebiasis, Girdiasis etc. Chemotherapy of Cancer (Neoplasms), Antiviral agents and Treatment of AIDS.

SECTION-B

3. **Hormones and related drugs**: Introduction to endocrine pharmacology, Pituitary hormones , Thyroid and antithyroid drugs, Hormones of Pancreas and hypoglycemic agents, Adrenal corticosteroids and corticosteroids, Gonadal hormones and their inhibitors, Oral contraceptives, drugs regulating Calcium Homeostasis.
4. **Pharmacology of drugs acting on Respiratory system:** Mucolytics, Expectorants, Antitussives, Asthma.
5. Opiods, NSAIDS, and Antipyretics-Analgesic. Drug for rheumatoid arthritis and gout.

Subject code: P-5.5

Subject : Pharmacology-II

PRACTICAL **45 Hours (3 hrs. /week)**

1. To demonstrate the CRC of suitable drugs (Ach/Histmine) on tissue preparation of animals
2. To perform the Interpolation bioassay of suitable drugs (Ach/ Histamine) on tissue preparation of animals
3. To perform the Matching type bioassay of suitable drugs (Ach/ Histamine) on tissue preparation of animals
4. To perform the multiple point bioassay of suitable drugs (Ach/ Histamine) on tissue preparation of animals
5. To study the drug induced catatonia in animals (Any one animal model-like baclofen/ clonidine/haloperidol/Pentazocine induced).
6. To study the effects of drugs on locomotor activity using Actophotometer.
7. To study the Analgesic activity using suitable method. (Hot Plate, Tail Flick/Caudal Immersion, Acetic Acid/Formalin-Induced**). Perform any three**
8. To study the anti-inflammatory activity property of Indomethacin.
9. To study Anticonvulsant activity using MES/ PTZ.
10. To study the drug induced catatonia (extrapyramidal side effect) in rats.
11. To study the effect of hepatic microsomal enzyme induction on the duration of action of phenobarbital sodium.

Note

- Suitable animal preparation- Any experiment suitable to demonstrate the concept- It could be either in-vivo or in-vitro, The animal selected may be mice, rat, rabbit, guinea pig as admissible as per prevailing Government/CPCSEA guidelines. In case of in-vitro preparations- any tissue preparation from above animals or various tissues from goat may be obtained from slaughter house/ abattoir /butcher shop.
- Agonist- Any agonist that can exhibit activity using the given preparation as reported in standard books/journals may be selected e.g.-Adrenaline and other catecholamines, Acetyl Choline, Histamine, Serotonin, oxytocin etc.
- Antagonist- Any antagonist that can exhibit blocking activity of above mentioned agonists in the given preparation as reported in standard books/journals may be selected.

Recommended Books

1. Goodman Gilman, The Pharmacological basis of therapeutics. Mc-graw Hill New Delhi.
2. Foster R.W. Basic Pharmacology, Arnold, New Delhi.
3. Stahl S. M.. Essential Psychopharmacology Cambridge University Press New Delhi.
4. Dipiro J.L. Pharmacotherapy Handbook. Tata McGraw Hill New Delhi.
5. Official books - Indian Pharmacopoeia, British Pharmacopoeia, United States Pharmacopoeia.
6. Tripathi K.D. Essentials of medical Pharmacology Jaypee New Delhi.
7. Barar F.S.K. Essentials of Pharmacotherapeutics, S. Chand & Company Ltd. New Delhi.
8. Rang H.P., Dale M.M. et. al. Pharmacology. Churchill L Ivingstone, New Delhi.
9. Katzung B.G .Basic & Clinical Pharmacology Mc-graw Hill, New Delhi.
10. Lewisôs Pharmacology. Churchill Livingstone London.
11. Harvey R.A., Champe P.C. Lippincottôs Illustrated Reviews-Pharmacology. Lippincott Williams & Wilkins, Pennsylvania.
12. Ghosh M.N. Fundamentals of Experimental pharmacology. Hilton & Company Kolkata.
13. Vogel G.H. Drug discovery and evaluation. Springer Germany.
14. Goyal R.K. Practicals in pharmacology. B.S. Shah Prakashan Ahmedabad.
15. Kulkarni S.K. Handbook of Experimental Pharmacology. Vallabh Prakashan. New Delhi.
16. Pillai, K. K. Experimental Pharmacology. CBS Publishers New Delhi.

17. Grover, J.K. Experiments in Pharmacy and Pharmacology Vol-II.CBS publishers New Delhi.
18. Perry W. L. M. Pharmacological Experiments on Isolated preparations. E.&S.Livingstone, London.
19. Kasture S.B.Text book of Experimental Pharmacology, Career Publication Nashik.
20. Official books - Indian Pharmacopoeia, British Pharmacopoeia, and United States Pharmacopoeia.
21. Related research papers from various journals.
22. Essentials of Pharmacotherapeutics, by F.S.K. Barar, Published by S.Chand and Co. Ltd., New Delhi.
23. A Text Book of Principles and Fundamentals in Pharmacology, Volume-I & II, by Dr.D.M.Sakarkar, Dr.S.V.Tembhurne, Ms.B.H.More, Published by Nirali Prakashan.

Subject code: T-5.6
Subject : Biopharmaceutics-I
THEORY **45 Hours (3 hrs. /week)**

SECTION-A

1) **Introduction to Biopharmaceutics:**
Concept of Bio-pharmaceutics scope and its importance various terms used and their role in related discipline.
2) **Absorption:**
GI absorption of drug, cell membrane structure and physiology Mechanism of drug absorption. Routs of drug administration (oral & non oral) Factors influencing drug absorption & bioavailability.
3) **Distribution :**
Factors influencing distribution of drugs. Volume of distribution. Plasma protein binding and its clinical significance. Tissue protein binding of drug.

SECTION-B

4) **Elimination:**
Mechanism of bio-transformation. Hepatic metabolism - chemical pathway & factors affecting it. Renal excretion Non-renal excretion
5) **Bioavailability and bioequivalence**
Definition, Objectives of bioavailability, parameters of bioavailability. Determination of AUC Methods of enhancement of bioavailability (solubilization, pro-drugs and enhancement of dissolution characteristics & bioavailability enhancers) Drug dissolution rate & bioavailability Theories of dissolution. In vitro drug dissolution testing models. In-vitro in-vivo correction. Various invitro and in vivo models.

Bioequivalence - Pharmaceutical equivalents, biological equivalents, therapeutic equivalents. Selection of animal.

Recommended Books

1. Biopharmaceutics and pharmacokinetics - Milo Gibaldi; Lea and Febiger book publication.
2. Biopharmaceutics and pharmacokinetics - An introduction - Robert E. Notary.
3. Biopharmaceutics - Swarbrick, Lea & Febiger book publications.
4. Remington Pharmaceutical Sciences.
5. Applied Biopharmaceutics and pharmacokinetics - Leon Shargel
6. Biopharmaceutics and pharmacokinetics - A treatise D.M.- Brahmankar & S.B. Jaiswal.
7. Clinical pharmacokinetics ï concept & application- Malcohm Rowland C., Thomas N. Tozer, Lea & Febiger Book.
8. Applied bio-pharmaceutics & pharmacokinetics ï Leon Shargel 3. Bio-pharmaceutics & pharmacokinetics ï Milo Gibaldi.
9. Bio-pharmaceutics & pharmacokinetics ï An introduction ï Rober E. Notary.
10. Pharmacokinetics Milo Gibaldi & Donald Perrier.
11. Bio-pharmaceutics & pharmacokinetics ï P.L. Madan
12. Handbook of clinical pharmacokinetics ï Gibaldi & Pancot.

Syllabus Prescribed for B. Pharm. Semester –VI
(Introduced from the Academic Session 2012-13)

SEMESTER-VI

Subject Code	Subject	Maximum Marks (Credits)		Total Marks (Credits)
		Theory	Practical	
6.1	Pharmaceutics-IV	80 (04)	80 (04)	160 (08)
6.2	Medicinal Chemistry-II	80 (04)	80 (04)	160 (08)
6.3	Pharmaceutical Analysis-II	80 (04)	80 (04)	160 (08)
6.4	Pharmacognosy-IV	80 (04)	80 (04)	160 (08)
6.5	Biopharmaceutics-II	80 (04)	80 (04)	160 (08)
6.6	Clinical Pharmacy	80 (04)	ð	80 (04)
6.7	Project	80 (04)		80 (04)
	Total			960 (48)

Subject code: 6.1
Subject : Pharmaceutics – IV
THEORY **45 Hours (3 hrs. /week)**

SECTION-A

1. **Cosmetology and cosmetic preparations:**
   Fundamental of cosmetic science, structure and functions of skin and hair, formulation, packing and evaluation of the following class of cosmetics.
2. **Hair products :** Shampoos, Hair creams, Hair dyes.
3. **Skin products :** Moisturizing, cleansing, vanishing creams, Face powder,
4. **Dentrifries products :** Tooth paste, tooth powder.

SECTION-B

1. **Manicure products :** Lipsticks, nail polish.
2. **Surgical products :** Primary wound dressing, absorbents, surgical cotton, surgical gauzes etc., bandages, adhesive tape, protective cellulosics, hemostastics, official dressings, absorbable and nonabsorbable sutures, ligatures and catgutûs, medical prosthetic and organ replacement materials.
3. **Blood products and Glandular products :** 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, dextrans. Glandular products like Insulin, pancreatin, thyroid and adrenal products.

Subject code: P-6.1
Subject : Pharmaceutics – IV
PRACTICAL **45 Hours (3 hrs. /week)**

1. Collection, processing storage and fractionation of blood.
2. Formulation and Evaluation of various types of cosmetics for skin, hair, dentifrice and manicure preparations.
3. Evaluation (quality test) of surgical dressings, (cotton, gauge, bandage and Adhesive tapes).

Recommended Books:

1. Avis K E, Lachman L and Lieberman H A, Marcel Dekker Inc. Pharmaceutical Dosage Forms; Parenteral Medications, Vols. 1 & 2, NY.

2. Bean H S, Beckett A H, and Carless A H Advances in Pharmaceutical Sciences, Vol 1-4 Academic Press, London.
3. Carter S J, Cooper and Gunnûs Dispensing for Pharmaceutical Students, CBS Publishers, Delhi.
4. Carter S J, Cooper and Gunnûs Tutorial Pharmacy CBS Publishers, Delhi.
5. Remingtonûs, the science and Practice of Pharmacy, Mack Publishing Co. Easton, Pernsybrania.
6. Sagarin & Balsam M.S., Cosmetic Science and Technology, Vol-1-3. 2nd ed. John Wiley sons, NY.
7. Stoklosa MJ, Pharmaceutical calculation, Lea and Febiger, Philadelphia.
8. Thomssen S.G., Modern Cosmetics, Universal Publishing Corporation, Bombay.
9. Harryûs Cosmeticology.

Subject code: T-6.2
Subject : Medicinal Chemistry-II
THEORY **45 Hours (3 hrs. /week)**

Section A

History, development, classification, recent development, mode of action (biochemical and molecular basis wherever applicable), SAR, IUPAC of following classes-

1) Anti-infective and Anti-invasive Agents:- Synthetic antibacterial agents eg. Sulfonamides, Quinolones, Nitrofurans etc., Antitubercular & Antileprotic agents, Antifungal agents, Antimalarials, Antiamebic agents, Anthelmintics, Antiviral agents including antiretroviral, Antineoplastic agents including recent drugs and monoclonal antibodies.

2) Antibiotics: â-lactam antibiotics, aminoglycosides, tetracycline, macrolides, Lincomycins, Polypeptides, Unclassified antibiotics

3) The outline of the synthetic procedure of the following drugs will also be covered: -
Sulphacetamide, Sulphanilamide, Sulphamethoxazole, Norfloxacin, Ciprofloxacin, Isoniazid, Pyrazinamide, Ethambutol, Dapson, Tolnaftate, Clotrimazole, Chloroquine, Primaquine, Amodiaquine, Metronidazole, Tinidazole, Diloxinide furoate, Mebendazole, Thiabendazole, Niclosamide, Idoxuridine, Thiotepa, Chlorambucil, Cyclophosphamide, Mechlorethamine, Chloramphenicol.

Section B

History, development, classification, recent development, mode of action (biochemical and molecular basis wherever applicable), SAR, IUPAC of following classes:

1) Opioid analgesic agents: Receptor subtypes and opioid antagonists

2) **NSAIDs & Antipyretics.**
3) **Antihistaminic agents**.
4) **Hormones:** Thyroid and antithyroidal agents
5) **The outline of the synthetic procedure of the following drugs will also be covered: -**Mepridine, Methadone, Mefenamic acid, Indomethacin, Ibuprofen, Naproxen, Acetaminophen, Phenylbutazone, Oxyphenbutazone, Aspirin, Diclofenac, Omeprazole, Diphenhydramine, Chloropheninramine, Chloropromazine, Promethazine, Cetrizine.

Subject code: P - 6.2
Subject : Medicinal Chemistry –II
PRACTICAL **45 Hours (3 hrs. /week)**

1) Laboratory scale preparation by conventional and microwave (desirable) one or two step synthesis of selected drugs and intermediates from course content and characterization by melting point / boiling point / thin layer chromatography Establishing the pharmaceutical standards of drug synthesized

Books Recommended

1. J. N. Delagado and W. A. R. Remers, Eds, Wilson and Giswold's Textbook of Organic, Medicinal and Pharmaceutical Chemistry, J. Lipponcott Co. Philadephia.
2. W. C. Foye, Principles of Medicinal Chemistry, Lea & Febiger, Philadelphia.
3. H. E. Wolff, Ed. Burger's Medicinal Chemistry, John Wiley & Sons, New York Oxford University Press, Oxford.
4. L G Chatten, A Textbook of Pharmaceutical Chemistry, Vol I & II, Marcel Dekker, New York.
5. S S Kadam, KR Mahadik, K G Bothara, Principles of Medicinal Chemistry Vol. I & II, 10th Edition, Nirali Prakashan.
6. Daniel Lednicer, Strategies for Organic Drug Synthesis & Design, John Wiley & sons, USA.
7. B. N. Ladu, H. G. Mandel & E. L. Way, Fundamental of Drug Metabolisum & Disposition, William & Wilkins co., Baltimore.
8. I. L. Finar, Organic Chemistry, Vol. I & II, ELBS/ Longman, London.
9. Vogel's Text book of Practical Organic Chemistry, ELBS/ Longman, London
10. Mann & Saunder, Practical Organic Chemistry, Orient Longman, London.
11. Shriner, Hermann, Morrill, Curtin & Fuson, The Syntematic Identification of Organic Compounds, John Wiley & Sons. USA.

Subject code: T-6.3
Subject : Pharmaceutical Analysis – II
THEORY **45 Hours (3 hrs. /week)**

Section-A

1. Gravimetric Analysis

Basic concepts, precipitation techniques, co-precipitation, post-precipitation.Various steps involved in gravimetric analysis. Application to I.P. product: Assay of sodium sulphate, assay of aluminiumin alum by oxime reagent.

2. Introduction to Solvent Extraction and its application

Principles of solvent extraction, Distribution ratio, efficiency of extraction, separation factor

Practical aspects of solvent extraction (factor affecting liquid-liquid extraction)

Selection criterion of solvent extraction, Method of extraction: Batch, counter-current, continuous extraction, stripping extraction and pH effect, soxhlet extraction method, salting out effect.

3. Basic concept in spectroscopy

Introduction- Electromagnetic radiation, wavelength, wave number, frequency, atomic spectra, molecular spectra. Classification of analytical methods, selecting an analytical method, classification of instrumental methods.

Instrumentation- Light Sources (IR, Visible, UV), Monochromators (Filters, Gratings), Cells (silicia, glass, quartz, cells for IR spectrophotometers), Detectors (Photo tubes, Photo diodes, read out system), Spectrophotometers (Single Beam, Double Beam).

UV-Visible Absorption Spectroscopy

Introduction, origin and theory of UV spectra, Bathochromic and Hypsochromic shift, choice of solvent, Beer-Lamberts Law, optimum conditions for spectrophotometric measurements, single component analysis, use of standard absorptivity value, use of calibration graph, multiple component analysis (simultaneous equation method, difference spectroscopy, derivative spectroscopy, chemical derivatization (colorimetric) reactions ï diazotization, condensation, acid dye, oxidation). Determination of lamada max. by Woodward-Fischer rule.

Section-B

1. Fluorescence and Phosphorescence Spectroscopy

Molecular luminescence, measurement of fluorescence, factor affecting fluorescence, quantitative aspects of fluorescence, Excitation and emission spectra, Instrumentation, advantages and disadvantages, applications and synchronous fluorescence.

2. **Atomic Emission and Atomic Absorption Spectroscopy**

   Principle, difference between atomic absorption spectroscopy and flame emission spectroscopy, advantages of AAS over Flame emission spectroscopy, limitation, instrumentation of atomic emission and atomic absorption spectroscopy, single and double beam spectrophotometer, pharmaceutical application of atomic emission and atomic absorption spectroscopy

3. **Miscellaneous methods of Analysis:-** Kjeldahlôs method of nitrogen estimation. Oxygen flask combustion techniques.

Subject code: P-6.3
Subject : Pharmaceutical Analysis –II
PRACTICAL **45 Hours (3 hrs. /week)**

List of Experiments :

1. **Gravimetric analysis :-**Determination of alum by oxime reagent, Determination of sodium sulphate.
2. Calibration of UV-VIS spectrophotometer as per I.P.
3. Determination of lamda max of drug.
4. To determine isosbestic point of an indicator.
5. UV spectrophotometric estimations of drug and from their formulations.
6. Assay by fluorimetry of a given drug. (e.g. Quinine Sulphate)
7. Determination of $Na^+$and K^+ by flame photometry after preparation of calibration curve.
8. **Miscellaneous Method** Nitrogen determination by Kjeldhalôs method.

Recommended Books

1. D.A.Skoog, D.M.West, F.J.Holler, S.R.Crouch, Fundamentals of Analytical Chemistry, 8th edition, 2004, Thomson Asia Pvt. Ltd.
2. Kenneth A. Connors, A textbook of Pharmaceutical Analysis, 3rd edition, 2002, John Wiley & Sons, New York, USA.
3. F.W.Fifield, D.Kealey, Principles and Practice of Analytical Chemistry, 5th edition, 2000, Blackwell Science, Oxford, U.K.
4. Gary D. Christian, Analytical Chemistry, 6th edition, 2004, John Wiley & Sons, New York, USA.
5. R.A.Day, Jr, A.L.Underwood, Quantitative Analysis, 6th edition, 2001, Prentice Hall of India.
6. Practical Pharmaceutical Chemistry Vol. ï I & II ï 4th Edition ï 1986 ï A.H.Beckett & J.B.Stenlake ï CBS Publishers, New Delhi.
7. A. R. Gennaro, Remington: The Science and Practice of Pharmacy Vol. I & II ï 20th Edition ï 2001 ï Lippincott, Williams & Wilkins, New York, USA.
8. The Indian Pharmacopoeia, Latest Edition, the Controller of Publications, Government of India, New Delhi
9. S.Ahuja, S.Scypinski, Handbook of Modern Pharmaceutical Analysis, 2001, Academic Press, New York, USA.

10. A.V.Kasture, K.R.Mahadik, S.G. Wadodkar, H.N.More, A Textbook of Pharmaceutical Analysis, Vol. I, 6th edition, 2002, Nirali Pprakashan, New Delhi.
11. D.C.Lee, M.L.Webb, Pharmaceutical Analysis, 2003, Blackwell Science, Oxford, U.K.
12. T.Higuchi, E.Brochmann-Hanssen, Pharmaceutical Analysis, 2002, CBS Publishers, New Delhi.
13. Lena Ohannesian, A.J.Streeter, Handbook of Pharmaceutical Analysis, 2002, Marcel Dekker, Inc. New York, USA.
14. P.Parimoo, Pharmaceutical Analysis, 2nd edition, 1991 CRC Press, New York.
15. The Indian Pharmacopoeia, Latest edition, the Controller of Publications, Government of India, New Delhi.
16. The British Pharmacopoeia.
17. The United State Pharmacopoeia.
18. J. Mendham, R.C.Denney, J.D.Barnes, M.Thomas, Vogelôs Textbook of Quantitative Chemical Analysis, 6th edition, 2002, Pearson Education Asia Ltd.
19. D.A. Skoog, F.J. Holler,T.A. Neiman, Principles of Instrumental Analysis, 5th edition, 2003, Thomson Asia Pvt. Ltd.

Subject code: T-6.4
Subject : Pharmacognocy-IV
THEORY **45 Hours (3 hrs. /week)**

SECTION-A

1. **Alkaloids:** Definition, general properties, chemical tests, general method of isolation of alkaloids, sources, diagnostic characters, chemistry, uses, substitute, adultrants and identification test of-
   a) Pyridine ï piperidine: Tobacco, Areca and Lobelia.
   b) Tropane : Belladonna, Hyoscyamus, Datura, Duboisia, Coca and Withania.
   c) Quinoline and isoquinoline: Cinchona, Ipecac, Opium.
   d) Indole: Ergot, Rauwolfia, Catharanthus, Nux-vomica and Physostigma.
   e) Imidazole: Pilocarpus.
   f) Steroidal: Veratrum and Kurchi.
   g) Alkaloidal amine: Ephedra and Colchicum.
   h) Glycoalkaloid: Solanum.
   i) Purines: Coffee, Tea and Cola.

2. **Essential oils:** Introduction, Definition, general properties, chemical nature, chemical tests and classification. General methods of isolation and analysis of volatile oils. Sources diagnostic characters, chemical constitutents and uses of oil of Mentha, coriander, cinnamon, cassia,

lemon peel, orange peel, lemon grass, citronella, caraway, dill, spearmint, clove, fennel, nutmeg, eucalyptus, chenopodium, cardamom, valerian, musk, palmrosa, gaultheria, sandal wood.

SECTION-B

3. Phytochemical screening : Selection of method (Preparation of an extract), Screening for alkaloids, polycyclic compounds, saponnis, sterols, cardenolides and bufadienolide, flavonoids and leucoanthocydins, tannins and poly phenols, anthraquinones.

4. Natural antioxidants and Neutraceuticals, Aromatherapy.

5. The historic concept of drugs administration in traditional system of medicines, studies of traditional drugs, common vernacular names, botanical sources, morphology, chemical nature of chief constituents, pharmacology, categories and common uses and marketed formulations of following indigenous drugs- amla, kantkari, shatavari, guduchi, bhilwa, kaligiri, bach, rasana, punarnawa, shitrak, apamarga, gokhuru, shankhapushpi, brahmi, adulsa, arjuna, ashoka, jyotishmati, methi, lashun, palash, guggul, gymnema, shilajit, nagarmotha and neem.

Subject code: P-6.4
Subject : Pharmacognocy-IV
PRACTICAL **45 Hours (3 hrs. /week)**

1. Morphological, Histological, Microchemical and chemical study of- Datura leaf
2. Morphological, Histological, Microchemical and chemical study of- Cinchona
3. Morphological, Histological, Microchemical and chemical study of- Rauwolfia
4. Morphological, Histological, Microchemical and chemical study of- Vasaka
5. Morphological, Histological, Microchemical and chemical study of- Isapgol seed
6. Morphological, Histological, Microchemical and chemical study of- Caraway fruit
7. Morphological, Histological, Microchemical and chemical study of- Cassia bark
8. Morphological, Histological, Microchemical and chemical study of- Kurchi bark
9. Morphological, Histological, Microchemical and chemical study of- Aswagandha
10. Morphological, Histological, Microchemical and chemical study of- Liquorice

11. Identification of powdered crude drugs and their combinations with the help of organoleptic, microscopic, micro-chemical and chemical methods. (Minimum 5 Expt.).
12. Few exercises on isolation of active principles from crude drugs.
13. Establishment of thin layer chromatographic profiles of some volatile oils and extracts containing alkaloids and glycosides.
14. Spotting of crude drugs mentioned in theory
15. Successive extraction and qualitative test for different extract.
16. Thin layer chromatographic study of different natural products.

Recommended Books :

1. Pharmacognosy by G.E. Trease, W.C. Evans, ELBS.
2. Pharmacognosy by Varro E.Tyler, Lynn. R.Brady, James E.Robbers.
3. Text Book of Pharmacognosy by T.E. Wallis, CBS Pub. Delhi.
4. Plant Physiology of Frank B.Salisburry, Cleon. W.Ross, CBS Pub. Delhi
5. Diosgenin and other steroid drug precursors by Asolkar,CSIR.
6. Antibiotics,Isolation&Seperationby Weinsted.M.I.Wagman,G.H.
7. Hormone Chemistry by W.R.Butt.
8. Quantitative analysis & Steroids by Gorog.S.
9. Steroids by Feiry & Feisher.
10. Alkaloids Chemical & Biological by S.W.Pelletier.
11. Biotechnology of Industrial antibiotics by E.vardemme.
12. Chromatography of Alkaloids by Vapoorte, Swendson.
13. Elements of chromatography by P.K.Lala.
14. Introduction to chromatography theory & Practicals by V.K. Srivastava, K.Kishore.
15. Principles of Biotechnology by Leininger.
16. Jenkins Quantitative Pharmacuetical Chemistry by A.N.Knevell.
17. Handbook of vitamins by L.J.Machlein.
18. Clerkôs Isolation & Identification of drugs by A.C.Mottal.
19. Selected Topics in Exp-Pharmacology by Seth.V.K.
20. Burgerôs Medicinal Chemistry by wolff.M.I.
21. Wilson & Gisvolds Text Book of organic Medicinal and Pharmacuetical Chemistry by Deorge.R.F.
22. Phytochemical methods of chemical analysis by Harbone.
23. Organic chemistry vol.II by I.L.Finar.
24. The Essential oil by Gunther.E.
25. The use of Pharmacological techniques for the evaluation of natural products by B.N.DhavanR.C.Srimal. CDRI, Lucknow.
26. Physical methods in organic chemistry by J.C.P.Schwartz.
27. Techniques in organic chemistry by Weiss Creger.
28. Practical Pharmacognosy by Dr.C.K. Kokate.
29. Practical Pharmacognosy by Dr.P.K.Lala.
30. Herbal medicines ï Janne Barnes, Linda. A.Anderson.

31. Chinese materia medica ï Yaru ï PingZhu.
32. Natural products from plants ï Peter.B.Kanfman.
33. Selection, Preparation and pharmacological evaluation of plant material, M.Williamson, DT.Okpako.
34. Indian Pharmacopoeia 2007
35. Herbal Pharmacopoeia.

Subject code: T-6.5
Subject : Biopharmaceutics-II
THEORY **45 Hours (3 hrs. /week)**

SECTION-A

1. **Introduction to pharmacokinetics**.
   Basic concept, Definition & introduction to absorption rate constant, bio-availability, volume of distribution, elimination half life, elimination rate constant, clearance, extraction ratio, area under curve, protein binding and tissue binding ï Calculation of parameters from plasma and urine data.
2. **Therapeutic regimens**
   ÅTherapeutic response and toxicity.
   ÅConstant rate regimens.
   ÅMultiple dose regimens.
3. **Compartment modeling**
   - Å Concept of compartment modeling, open and closed models.
   - Å One compartment open model- IV bolus, IV infusion extra vascular administration
   - Å Multi compartment modeling ï 2 compartment and 3 compartments models, determination of compartment models.
4. **Non linear pharmacokinetics**
   - Å Saturable enzymatic elimination process, drug elimination by capacity limited pharmacokinetics, mixed drug elimination, time dependent pharmacokinetics, bio-availability of drug that follow nonlinear pharmacokinetics, non-linear pharmacokinetics due to protein binding (eq. Phenytoin)

SECTION-B

1. **Pharmacokinetics basis of variability in clinical response** :-
   Genetics Age and weight, Disease altering / affecting pharmacokinetic parameter. (special reference to hepatic and renal disease)
2. **Drug interactions:-**
   Classification altered absorption and distribution, therapeutic implication causes of drug interaction, alteration in drug metabolism
3. Assessment of AUC, estimation of elimination half life from urine data, estimation of absorption kinetics from plasma concentration data, mean residence time, amount of drug in body on accumulation

to plateau, distribution of drugs extensively bound to plasma proteins, blood plasma concentration ratio. Estimation of creatinine clearance under non-steady conditions.

4. **Problems based on all above chapters**.

Subject code: P-6.5
Subject : Biopharmaceutics-II
PRACTICAL **45 Hours (3 hrs. /week)**

1. Experiments for determination of pharmacokinetics parameters & bioavailability based on salivary & urinary excretion of drug formulations using human volunteers.
2. To study the influence of simulated gastric & intestinal pH on stability & hydrolysis of drugs.
3. Establishment of standard curve of a drug substance.
4. Influence of vehicle on drug availability from topical dosage forms in-vitro.
5. Comparative in-vitro release rate studies of marketed formulations.
6. Determination of bioavailability of marketed formulations by plasma concentration method.
7. Determination of bioavailability of marketed formulations by urinary excretion method.
8. Effect of protein binding by egg albumin; dialysis method.
9. Determination of pharmacokinetic parameters, determination and evaluation of bioavailability of drug administered by IV, IM and P.O. Practice numericals based on the portions covered under theory syllabus.

Recommended Books

1. Biopharmaceutics and pharmacokinetics - Milo Gibaldi; Lea and Febiger book publication.
2. Biopharmaceutics and pharmacokinetics - An introduction - Robert E. Notary.
3. Biopharmaceutics - Swarbrick, Lea & Febiger book publications.
4. Remington Pharmaceutical Sciences.
5. Applied Biopharmaceutics and pharmacokinetics - Leon Shargel
6. Biopharmaceutics and pharmacokinetics - A treatise D.M.- Brahmankar & S.B. Jaiswal.
7. Clinical pharmacokinetics ï concept & application- Malcohm Rowland C., Thomas N. Tozer, Lea & Febiger Book.
8. Applied bio-pharmaceutics & pharmacokinetics ï Leon Shargel 3. Bio-pharmaceutics & pharmacokinetics ï Milo Gibaldi.
9. Bio-pharmaceutics & pharmacokinetics ï An introduction ï Rober E. Notary.
10. Pharmacokinetics Milo Gibaldi & Donald Perrier.
11. Bio-pharmaceutics & pharmacokinetics ï P.L. Madan
12. Handbook of clinical pharmacokinetics ï Gibaldi & Pancot.

Subject code: T-6.6
Subject : Clinical Pharmacy
THEORY **45 Hours (3 hrs. /week)**

SECTION-A

1. Definition, scope, history and development of clinical pharmacy.
2. **Introduction to daily activities of a clinical pharmacist:** Drug therapy monitoring (medication chart review, clinical review, pharmacist intervention), Ward round participation, Medication history, Patient counseling).
3. **Patient data analysis:** Clinical laboratory tests used in evaluation and interpretation of disease state like: Haematological, Liver function, Renal function, Thyroid function test.
4. **Prescribing guidelines for** Paediatric patients, Geriatric patients, Pregnancy and breast feeding.
5. **Drug and poison information:** Introduction to drug information resource available, Systemic approach in answering drug information queries, Critical evaluation of drug information and literature, Preparation of return and verbal reports, establishing a drug information centre.
   Poison informations ï organisation and information resources.

SECTION-B

6. **Clinical pharmacokinetics:** Physiological pharmacokinetics models, determination of drug clearance and volume of distribution, Renal and non-Renal clearance, Organ extraction and models of hepatic clearance, Estimation and determination of bioavailability, Multiple dosing, Calculation of loading and maintenance dose, Dose adjustment in renal failure, Hepatic dysfunction patient.
7. **Designing and conducting of clinical trials:** Guidelines for good clinical research practice and Ethical requirements, various phases of clinical trials, Monitoring and auditing of clinical trials.
8. **Monitoring of drug therapy:** Therapeutic, Pharmacokinetic and pharmacodynamic monitoring of drug therapy.
9. **Adverse reactions to drug:** Incidence, classifications, and surveillance methods of adverse reactions to drugs.
10 **Pharmacogenetics:** Pharmacokinetic and Pharmacodynamic aspects of pharmacogenetics.
11. **Drug interaction:** Different types of interactions with drugs and their incidence, Clinical aspects of Pharmacokinetic and pharmacodynamic drug interaction.

Recommended Books

1. Bennett P.N, Brown M.J. Clinical Pharmacology Churchill living stone New Delhi.
2. Melmon & Morrelliôs Clinical Pharmacology. Mc-Graw Hill. New Delhi.
3. Raymond J.M. Niesink, John de vries. Hollinger M.A. Toxicology-Principle and applications, CRC, Florida
4. Remingtonôs Pharmaceutical Science and practice pharmacy. Lippincott Williams and Wilkins, New Delhi.
5. Clinical Pharmacy & Therapeutics- Eric T Hefindal. Williams & Wilkins Publications.
6. Clinical Pharmacokinetics- Rowland and Tozer, Williams and Wilkins Publications.
7. Biopharmaceuticals and Applied Pharmacokinetics- Leon Shargel, Prentice and Hall publications.
8. Parrthsarthi G, Hansen Kavin Nytort & Nahata Milap C. A Textbook of Clinical Practice: Essential Concepts & skills, Orient Longman.
9. Roger walker, Clive Edwards, Clinical Pharmacy & therapeutics, 3rd International Edition, Churchill Livingstone.
10. Dr. Tipnis H. P, Dr. Bajaj Amrita, Clinical Pharmacy, Career Publication.
11. Grahame-Smith D.G. & Aronson J.K. Oxford textbook of clinical Pharmacology and drug therapy. Oxford University press London

Subject code: P-6.7
Subject : Project
45 Hours (3 hrs. /week)

Project

The topic for the **project shall be based on the practical work /theoretical/ review oriented /any topic from current Pharmaceutical development** and shall be assigned to him/her by the respective guide from faculty members immediate from the date of the commencement of the sixth semester.

Evaluation of the project should be based on Introduction and information retrieval systems, Organization of material and references in the project report, Representation, Skill in oral presentation, Questioning and defending, and finally on the report. The report shall be submitted in hard bound to the respective guide/Head of Department/ Library.

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ENVIRONMENTAL STUDIES

Total Marks : 100

PART-A

SHORT ANSWER PATTERN 25 Marks

1. The Multidisciplinary nature of environmental studies

- Definition, scope and importance.
- Need for public awareness. (2 lecture hours)

2. Social Issues and the Environment

- From Unsustainable to Sustainable development
- Urban problems related to energy
- Water conservation, rain water harvesting, watershed management
- Resettlement and rehabilitation of people; its problems and concerns.
  Case studies.
- Envionmental ethics : Issues and possible solutions.
- Climate change, global warming, acid rain, ozone layer depletion, nuclear
  accidents and holocaust. Case studies.
- Wasteland reclamation.
- Consumerism and waste products.
- Environment Protection Act.
- Air (Prevention and Control of Pollution) Act.
- Water (Prevention and Control of Pollution) Act.
- Wildlife Protection Act.
- Forest Conservation Act.
- Issues involved in enforcement of environmental lesislation.
- Public awareness. (7 lecture hours)

3. Human Population and the Environment

- Population growth, variation among nations.
- Population explosion - Family Welfare Programme.
- Environment and human health.
- Human Rights.
- Value Education.
- HIV / AIDS.
- Women and Child Welfare.
- Role of Information Technology in Environment and human health.
- Case Studies. (6 lecture hours)

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PART-B

ESSAY TYPE WITH INBUILT CHOICE

50 Marks

4. Natural resources :

- **Renewable and non-renewable resources :**
- Natural resources and associated problems.
- Forest resources : Use and over exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forests and tribal people.
- Water resources : Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems.
- Mineral resources : Use and exploitation, environmental effects of extracting and using mineral resources, case studies.
- Food resources : World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer - pesticide problems, water logging, salinity, case studies.
- Energy resources : Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources, Case studies.
- Land resources : Land as a resource, land degradation, man induced landslides, soil erosion and desertification.
- Role of an individual in conservation of natural resources.
- Equitable use of resources for sustainable lifestyles.
  (8 lecture hours)

5. Ecosystems

- Concept of an ecosystem.
- Structure and function of an ecosystem.
- Producers, consumers and decomposers.
- Energy flow in the ecosystem.
- Ecological succession.
- Food chains, food webs and ecological pyramids.
- Introduction, types, characteristic features, structure and function of the following ecosystem :-
- Forest ecosystem
- Grassland ecosystem
- Desert ecosystem

- Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries) (6 lecture hours)

6. Biodiversity and its conservation

- Introduction - Definition : genetic, species and ecosystem diversity.
- Biogeographical classification of India.
- Value of biodiversity : consumptive use, productive use, social, ethical, aesthetic and option values.
- Biodiversity at global, National and local levels.
- India as a mega-diversity nation.
- Hot-spots of biodiversity.
- Threats to biodiversity : habitat loss, poaching of wildlife, manwildlife conflicts.
- Endangered and endemic species of India.
- Conservation of biodiversity : In-situ and Ex-situ conservation of biodiversity. (8 lecture hours)

7. Environmental Pollution

- **Definition**
- Causes, effects and control measures of :-
  - Air pollution
  - Water pollution
  - Soil pollution
  - Marine pollution
  - Noise pollution
  - Thermal pollution
  - Nuclear hazards
- Solid Waste Management : Causes, effects and control measures of
- Role of an individual in prevention of pollution.
- Pollution case studies.
- Diaster management : floods, earthquake, cyclone and landslides. (8 lecture hours)

PART-C

ESSAY ON FIELD WORK

25 Marks

8. Field work

- Visit to a local area to document environmental assets - river / forest / grass land / hill / mountain
- Visit to a local polluted site - Urban / Rural / Industrial / Agricultural
- Study of common plants, insects, birds.
- Study of simple ecosystems - pond, river, hill slopes, etc.

(5 lecture hours)

(**Notes :** i) Contents of the syllabys mentioned under paras 1 to 8 shall be for teaching for the examination based on Annual Pattern.

ii) Contents of the syllabys mentioned under paras 1 to 4 shall be for teaching to the Semester commencing first, and

iii) Contents of the syllabys mentioned under paras 5 to 8 shall be for teaching to the Semester commencing later.

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