

## **Rajiv Gandhi Proudyogiki Vishwavidalaya, Bhopal (M.P.)**

### **B. PHARMA-VI SEMESTER (Modified on 03/09/12)**

#### **Pharmaceutical Industrial Management PY-601**

Status of pharmaceutical industries in India.

Project formulation, evaluation and implementation.

Pharmaceutical Factory Planning and layouts, preparation of flow diagrams, technical data sheets.

#### **Pharmaceutical Management :**

Concepts on Management, Principles of Management, Administrative and Operative Management Entrepreneurship Development.

Material management: Basic principles of Material Management, Purchase, Store and Inventory control.

#### **Pharmaceutical Production Management :**

Different aspects of Production Management , Performance Evaluation Technique, flow-process, know how process and maintainence.

Accountancy: Principles of accountancy, Journal entries and ledger posting, preparation of trial balance, cash book, bank reconciliation statement, rectification of errors, profits and loss account, balance sheet, purchase, keeping and pricing of stocks, treatment of cheques, bill of exchange, promissory notes and hundies, documentary bills.

#### **Pharmaceutical Economics:**

Principles of economics with special reference to the laws of demands and supply, demand schedule, demand curves, general principles of insurance and inland and foreign trade, procedure of exporting and importing goods.

Pharmaceutical Marketing: Functions, wholesale, retail, and mail order business ,market research.

#### **Pharmaceutical Salesmanship:**

Principles of sales promotion, advertising, and ethics of Sales, merchandising, Window display and literature detailing.

#### **BOOKS RECOMMENDED:**

1. Shukla, S. M., Advanced Accountancy, Mahershwari Sahitya Bhawan, Agra.
2. Gupta, R. L., Advanced Accountancy, Vol. I and II, Sultanchand & Company, New Delhi.
3. Kotler, P., Marketing Management, Prentice Hall of India Limited.
4. Stanton, W. J., Fundamentals of Marketing Tata McGraw Hill Limited, New Delhi.
5. Buskir K. and Richard H., Principles of Marketing – The Management View, Hold Rinehard and Winston Incorporated, New York.
6. Sherlekar, S. R., Marketing Management, Himalaya Publishing House, New Delhi.
7. Mote,V. L., Paul, S. and Gupta, G. S., Managerial Economics Concepts and Cases, Tata McGraw Hill Limited, New Delhi.

## **Pharmaceutical Analysis II - PY 602**

The theoretical aspects, basic instrumentation, elements of interpretation of spectra and pharmaceutical application of the following analytical techniques –

1. Chromatography: Paper Chromatography TLC, GLC, HPTLC and HPLC.
2. Ultraviolet and visible spectrophotometry: Beer-lambert law, electronic transitions, instrumentation, methods, chemical derivatisation, structural analysis, applications.
3. Infra red spectrophotometry & FT-IR: Introduction, Theory, instrumentation, interpretation of spectra, its advantages and applications in structure elucidation.
4. Fluorimetry.
5. Mass Spectroscopy: Introduction, ionization techniques, mass analyzers, fragmentation rules, instrumentation, the mass spectrum & its applications.
6. NMR Spectroscopy: Introduction, continuous-wave (CW) NMR spectrometry, pulsed fourier transform spectrometry, chemical shift, spin coupling, spin decoupling & its applications.
7. Atomic Absorption.
8. X- Ray Diffraction.
9. Flame Photometry.
10. Immunoassay techniques: Enzymes & radioimmunoassay techniques, theory, methods & its applications.

### **BOOKS RECOMMENDED:**

1. Svehla, G. Vogel's Text Book of Micro and Semi Micro Qualitative Inorganic Analysis, Orient Longman, Hyderabad.
2. Beckett, A.H. and Stenlake, J.B., Practical Pharmaceutical Chemistry, The Athlone Press of the University of London.
3. Chatten, L.G., Text Book of Pharmaceutical Chemistry, Marcel Dekker, New York.
4. Connors, K.A., A Text Book of Pharmaceutical Analysis, Wiley Interscience, New York.
5. Higuchi, J. and Hansen E.B., Pharmaceutical Analysis, Interscience Publisher John Willey and Sons, New York, Sydney.
6. Silverstein, R.M., Bassier, G.C., and Morrill, T.C., Spectrophotometric Identification of Organic Compounds, John Wiley and Sons Inc.
7. Willard, Merritt and Settle, Instrumental Methods of Chemical Analysis, CBS Publisher and Distributors, New Delhi.
8. Ewing, G.W., Instrumental Methods of Chemical Analysis,.

**LIST OF PRACTICALS :**

1. Determination of solvent cut off value of different solvents.
2. Study of effect of various solvents on spectral features of any drug.
3. Perform the quantitative spectrophotometric estimation of drug by single point method.
4. Perform the quantitative spectrophotometric estimation of drug by calibration curve method.
5. Perform the quantitative spectrophotometric estimation of drug by standard absorptivity method.
6. Simultaneous quantitative spectrophotometric estimation of two drugs by simultaneous equation method.
7. Simultaneous quantitative spectrophotometric estimation of two drugs by dual wavelength method.
8. Simultaneous quantitative spectrophotometric estimation of two drugs by derivative spectroscopy.
9. To determine the tablet content of norfloxacin by hydrotrophy.
10. Interpretation of given IR spectra.
11. Quantitative estimation of alprazolam (Any drug) by RP-HPLC.
12. Simultaneous quantitative estimation of torsemide and spironolactone ( Combination of two drugs) by RP-HPLC.
13. Acid and alkaline stress degradation study of any drug.
14. Photo and thermal stress degradation study of any drug.
15. Oxidative stress degradation study of any drug.

**PHARMACEUTICAL CHEMISTRY – VII PY-603 (MEDICINAL CHEMISTRY-II)**

**( I ) Classification and mode of action, uses, structure activity relationship including physicochemical, steric aspects and recent advances in research of the following categories of drugs:**

**(A) Drug Acting on CNS**

- General Anesthetics: Stages of Anesthesia , Pharmacokinetic Principles, Theories of the mechanisms.
- Hypnotics and Sedatives : Testing and developments of new Hypnotics.
- Antiscizure agents: Drugs effective against partial and generalized tonic-clonic scizure.
- Opiod Analgesics : Endogenous opioid peptides and their physiologic functions, Neurobiology of drug abuse and addiction.
- Antiparkinsonian and Spasmolytic agents : Pharmacotherapy of Parkinsons disease.
- Hallucinogens, Stimulants, and related drugs of Abuse.
- Psychopharmacological Agents: Antipsychotic agents, Antidepressants, Anxiolytics.

**(B) Drug Acting on GIT :**

- Laxative
- Antidiarrhoeal
- Anti spasmodic
- Antiulcers Drugs.

**(C) Drug Acting on Hormonal System:**

- Insulin and oral Hypoglycemic agents: Etiology of Diabetes, Biochemistry and Pathogenesis of Diabetes, Production of Insulin.
- Adrenocorticoids: Mechanism of steroid Hormone action, Development of Adrenocorticoid drugs.
- Sex Hormones: Male sex Hormones, Female sex Hormones.
- Thyroid and Antithyroid agents : Biochemistry and Physiology of Thyroid Hormones, Biosynthesis of Thyroid Hormones.

**(D) Vitamins**

**( II ) Principles of Drug Design (Theoretical Aspects). Scientific Aspects of Drug Discovery, Preclinical Development, Mechanism based Approaches (Computer Aided Drug Design and Molecular Modeling)**

**BOOKS RECOMMENDED:**

1. Foye, W.C., Principles of Medicinal Chemistry, Lea and Febiger, Philadelphia.

2. Wolff , M.E. Ed., Burger's Medicinal Chemistry, John Wiley and Sons, New York.
3. Hansch, C., Comprehensive Medicinal Chemistry, Pergamon Press, Oxford.
4. Delagado, J.N. and Remers, W.A.R, Wilson and Giswold's Text Book of Organic, Medicinal and Pharmaceutical Chemistry, J.Lippincott Co., Philadelphia.
5. Nogady, T., Medicinal Chemistry-A Biochemical Approach, Oxford University Press, New York, Oxford.
6. Kar, A., Medicinal Chemistry, Willey Eastern Ltd., New Delhi.
7. Patrick, G., An Introduction to Medicinal Chemistry, Scientific Distributors, Mumbai.
8. Malone, Dyson and Purey, May's Chemistry of Synthetic Drugs.
9. Parimoo, P., Text Book of Medicinal Chemistry, CBS Publishers and Distributors, New Delhi.
10. Thomas, G., Introduction to Medicinal Chemistry, CBS Publishers and Distributors, New Delhi.

### **LIST OF PRACTICALS :**

1. Synthesis and Characterization of Methylphenobarbital from Urea.
2. Synthesis and Characterization of Barbital from Urea.
3. Synthesis and Characterization of Nikethamide from Nicotinic acid.
4. Synthesis and Characterization of Pantaprazol.
5. Synthesis and Characterization of Diclofenamide.
6. Synthesis and Characterization of Phenobarbitone.
7. Synthesis and Characterization of Phenothiazine.
8. Synthesis and Characterization of Furosemide from 2,4 dichloro-benzoic acid.
9. Synthesis and Characterization of Levodopa from Vanillin.
10. Synthesis and Characterization of Sulfalene from p-aminobenzene sulphonyl chloride.
11. Synthesis and Characterization of Thioridazine.
12. Synthesis and Characterization of Chlorpromazine.

13. Synthesis and Characterization of Benorilate.
14. Synthesis and Characterization of Parbanic acid.
15. Estimation of  $\text{Na}^+$ ,  $\text{K}^+$ ,  $\text{Ca}^{++}$  ions using flame photometry.
16. To perform the QSAR Analysis by Free Wilson Approach.
17. To determine the regression coefficients for a series by using Hansch and Free Wilson Approach.
18. To determine the correlation between physiochemical properties and biological activity for a series by using Hansch analysis.

## PHARMACOGNOSY – IV (PY 604)

General introduction classification and brief description of different chromatographic techniques with detailed emphasis on application of paper chromatography, column chromatography, TLC, HPLC and HPTLC in the evaluation of herbal drugs.

Historical development of plant tissue culture technique, types of culture, nutritional requirements, surface sterilization of explants, growth and maintenance. Application of PTC in development of phytoconstituents.

An introduction of marine pharmacognosy and novel agents from marine sources like cardiovascular active substances, cytotoxic, antimicrobial, antibiotic, anti-inflammatory, antispasmodic agents, marine toxin etc.

Herbs as health food, cosmeceuticals.

An introduction to cultivation and utilization of aromatic plants with special reference to sandalwood oil, menthe oil, eucalyptus oil, lemon grass oil, clove oil.

Production and analysis of phytoconstituents of pharmaceutical importance like quinine, strychnine, atropine, morphine podophyllotoxin, papain, vincristine, ephedrine and Tannic acid, Spectral analysis of herbal drugs with emphasis on application of UV, IR, NMR, mass.

Natural dyes, Immunomodulators and Adaptogens.

### **LIST OF PRACTICAL:**

1. To perform chromatography of amino acids
2. To perform paper chromatography of sugars
3. To perform TLC of alkaloids
4. To perform TLC of extract of rauwolfi, datura
5. To perform TLC of volatile oils i.e. eucalyptus oil, menthe oil
6. To identify the presence of eugenol in clove oil by TLC
7. To determine volatile oil content of eucalyptus leaf

8. To determine volatile oil content of fennel fruits
9. To isolate ammonium glycyrrhizinate from glycyrrhiza
10. To extract aloin from aloe
11. To extract tannic acid from myrobalan
12. To perform column chromatography a natural dye.

**BOOKS RECOMMENDED:**

1. Trease, G.E. and Evans, W.C., Pharmacognosy, Bailliere, Tindall, Eastbourne, U.K.
2. Tayler, V.E., Brady, L.R. and Robers, J.E., Pharmacognosy Lea and Febiger, Philadelphia
3. Kokate, C.K., Purohit, A.P. and Gokhale, S.B., Pharmacognosy Nirali Prakashan, Pune
4. C.R Atal and B.M. Kapoor, Cultivation & Utilization of Aromatic Plants, Council of Scientific Industrial Research (CSIR) New Delhi.



### **Pharmacology-III (PY 605)**

#### **Pathophysiology of diseases of cardiovascular system and pharmacology of drugs used for their treatment**

- a) Cardiac Glycosides
- b) Antiarrhythmic drugs
- c) Antianginal drugs
- d) Antihypertensive drugs

#### **Pharmacology of drugs acting on hematopoietic system**

- a) Hematinics
- b) Drugs affecting coagulation, bleeding and thrombosis
- c) Plasma expanders
- d) Hypolipidaemic drugs

#### **Pharmacology of drugs acting on urinary system**

#### **Pathophysiology of diseases of endocrine system and pharmacology of drugs used for their treatment**

- a) Hypothalamic and pituitary hormones
- b) Thyroid hormones and antithyroid drugs
- c) Insulin, oral hypoglycemic agents and glucagons
- d) Corticosteroids
- e) Androgens and drugs for erectile dysfunction
- f) Estrogens, progestins and contraceptives
- g) Oxytocin and drugs acting on uterus
- h) Drugs affecting calcium balance

#### **List of Practicals**

1. Determine the strength of given sample (acetyl choline/ histamine) by three point bioassay method using isolated organ preparation (rat ileum/ rat duodenum/ rat colon/ rat fundus/ guinea pig ileum).

2. Determine the strength of given sample (acetyl choline/ histamine) by four point bioassay method using isolated organ preparation (rat ileum/ rat duodenum/ rat colon/ rat fundus/ guinea pig ileum).
3. Record the concentration response curve of oxytocin using rat uterus preparation.
4. Determine the sympatholytic activity of given drug sample using isolated guinea pig ileum preparation.
5. Compare the diuretic/saluretic activity of different drugs in rats.
6. Determine the effect of anticoagulants by subaqueous tail bleeding time method in rodents.
7. Study the effect of oral hypoglycemic agents in diabetic rodents.
8. Study the effect of thyroid hormones on the tensile strength of connective tissues in rats.
9. Study the effect of growth hormone on the weight gain in female rats.

#### **BOOKS RECOMMENDED**

- 1) Herfindal, E.T., Gourley, D.R., (eds.) (2000) Textbook of therapeutics Drug and disease management. 7<sup>th</sup> ed. Baltimore: Lippincott Williams and Wilkins
- 2) Hardmen, J.G., Limbird, L.E., Gilman A.,G., (eds.) (2001) Goodman and Gilman's The pharmacological basis of therapeutics. 10<sup>th</sup> ed. USA: The McGraw Hill Companies
- 3) Kumar, V., Abbas, A.K., Fausto, N., (eds.) (2004) Robbins and Cotran Pathologic basis of disease. 7<sup>th</sup> ed. Pennsylvania: Saunders
- 4) Barar, F.S.K., (2000) Essentials of therapeutics. New Delhi: S. Chand and Company (P) Ltd.
- 5) Satoskar, R.S., Bhandarkar, S.D., Rege, N.N., (2007) Pharmacology and Pharmacotherapeutics. 12<sup>th</sup> ed. Mumbai: Popular Prakashan
- 6) Seth, S.D., (ed.) (2005) Textbook of Pharmacology. 2<sup>nd</sup> ed. New Delhi. Elsevier
- 7) Tripathi, K.D. (1999) Essentials of medical pharmacology. 4<sup>th</sup> ed. New Delhi: Jaypee Brothers Medical Publishers (P) Ltd.
- 8) Rang, H.P., et al. (eds.) (2003) Pharmacology. 5<sup>th</sup> ed. Philadelphia: Elsevier
- 9) Katzung, B.G., (2004) Basic and clinical pharmacology. 9<sup>th</sup> ed. USA: The McGraw Hill Companies.

- 10) Pillai, K.K., (2009) Experimental Pharmacology. New Delhi, CBS Publishers and Distributers.
- 11) Kulkarni, S.K., (2005) Handbook of Experimental Pharmacology. New Delhi, Vallabh Prakashan.
- 12) Vogel, H.G., (ed.) (2002) Drug Discovery and Evaluation. Pharmacological Assays. 2<sup>nd</sup> Ed. Heidelberg, Germany, Springer-Verlag.