

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY  
HYDERABAD**

IV Year B. Pharm I-Sem

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**(R9601) PHARMACEUTICAL ANALYSIS - II**

**UNIT - I**

**UV & Visible Spectrophotometry** : Introduction to Spectroscopy, Basic terminology - Chromophore, Auxochrome, Bathochromic shift, Hypsochromic shift, hyperchromic and hypochromic shift. UV & Visible Spectrophotometry : Principle, Theory, Beer-Lamberts Law & Deviations, Instrumentation - Single Beam and Double Beam Spectrophotometers, Applications, Woodward -Feiser rule.

**UNIT - II**

**Flourimetry** : Principle, Theory, Quenching, Instrumentation and applications.

**Atomic Absorption Spectroscopy** : Principle, Theory, Instrumentation and applications.

**UNIT - III**

**Infrared Spectrophotometry (IR)** : Introduction, Principle, Theory, types of vibrations, Instrumentation, Single and double beam spectrophotometer, sampling techniques, applications, basic principles in the interpretation of IR Spectra.

**UNIT - IV**

**Nuclear Magnetic Resonance Spectrophotometry (NMR)** : Basic Principle, Theory, Instrumentation, Chemical shift, Shielding and Deshielding, Relaxation processes, spin-spin splitting, applications, basic principles in the interpretation of NMR spectra.

**UNIT - V**

**Mass Spectrometry** : Basic Principle, Theory, Instrumentation and Applications, basic principles in the interpretation of Mass Spectra.

**UNIT - VI**

**Basic Principles and applications** of differential thermal analysis (DTA) and differential scanning calorimetry (DSC).

Basic Principles and applications of X-ray Diffraction Analysis (XRD).

[www.engineershut.in](http://www.engineershut.in)

**UNIT - VII**

**Optical rotatory dispersion (ORD) and Circular dichroism** : General Principles, instrumentation and Applications.

Radio Immuno Assay & Enzyme Linked Immuno Sorbent Assay (ELISA).

**UNIT - VIII**

Gas Chromatography, High Performance Liquid Chromatography (HPLC) and High Performance Thin Layer Chromatography (HPTLC).

**Electrophoresis** : Scope, Different types of Electrophoresis and applications.

[www.engineershut.in](http://www.engineershut.in)

**TEXT BOOKS**

1. R.M. Silvesterin and G.C. Bassler. Spectrometric Identification of Organic Compounds.
2. AH Beckett & Stenlake, Text book of Practical Pharmaceutical chemistry, Vol.I&II
3. AI Vogel, Quantitative Chemical Analysis.
4. Hobart. H. Willard and others, Instrumental methods of analysis, CBS publ and Distributors New Delhi.
5. Robert D. Brown, Introduction to Instrumental Analysis.
6. Skoog, Principles of Instrumental Analysis.
7. B.K.Sharma, Instrumental and Chemical Analysis, Goel Publ House, Hyderabad

**REFERENCES**

1. Settle, Handbook of Instrumental Techniques for Analytical Chemistry.
2. Y.Anjaneyulu & Maraiiah, Quality Assurance & Quality Management in Pharmaceutical Industry.
3. P.D. Sethi, Quantitative analysis of Drugs and Pharmaceuticals.
4. K. A. Connors, A Textbook of pharmaceutical analysis, Wiley Interscienc, NY.
5. A.M. Knevel & F.E. Digengl, Jenkin's quantitative pharmaceutical chemistry, Mc Graw Hill Book Co., NY.
6. Pharmacopoeia (IP, BP, USP, PhI, Eu. PhI).

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(R9602) BIOPHARMACEUTICS AND PHARMACOKINETICS

**UNIT-I**

**Introduction :**

Definitions of Biopharmaceutics, Pharmacokinetics and Pharmacodynamics.

**UNIT-II**

[www.engineershub.in](http://www.engineershub.in)

**Drug Absorption.** Mechanisms of GI absorption, physico-chemical, biological and dosage form factors influencing absorption.

**UNIT-III**

**Drug distribution.** Factors drug distribution, volume of distribution, protein binding – factors affecting and significance and kinetics of protein binding.

**UNIT-IV**

**Drug Metabolism :** Pathways of drug metabolism. Phase-I (oxidative, reductive and hydrolytic reactions). Phase II reactions (conjugation) Enzyme induction and inhibition

**UNIT-V**

**Drug excretion.** Glomerular filtration, tubular secretion and reabsorption, effect of pH and other drugs. Clearance concept, excretion through bile, feces, lungs and skin in brief.

**UNIT-VI**

**Bioavailability and bioequivalence**

Definitions, concept of equivalents, Definitions of various types of equivalents, types of Bioavailability studies, measurement of Bioavailability, plasma level and urinary excretion studies. Bioequivalence study design. Bioavailability testing procedure and protocol.

**UNIT-VII**

**Pharmacokinetics.** Basic considerations, compartment modeling, one compartment open model - i.v. bolus and extra vascular administration, urinary excretion studies. Calculation of pharmacokinetic parameters, brief over view of nonlinear kinetics, noncompartmental models

**UNIT-VIII**

**Biostatistics :** Theory of probability, Histogram, standard error, t-test, regression analysis, coefficient of correlation, curve fitting. Analysis of variance (ANOVA), non parametric tests.

**TEXT BOOKS**

1. Venkateshwarlu, Fundamentals of Biopharmaceutics and Pharmacokinetics, Pharma Book Syndicate.
2. Milo Gibaldi, Biopharmaceutics and clinical pharmacokinetics 4/ Edn. Pharma Book Syndicate. Hyderabad
3. DM Brahmankar and SB Jaiswal, biopharmaceutics and pharmacokinetics- a treatise, vallabh prakasham, Delhi,
4. P.L. Madan, Biopharmaceutics and Pharmacokinetics, Jaypee Bros.

**REFERENCES**

1. Remington's pharmaceutical sciences, Mac Pub. Co., Easton Pennsylvania.
  2. Modern pharmaceutics by banker Marcel Dekker Inc., NY
  3. L. Iachman, H.A. Lieberman, J.L. Kanig, the theory and practice of industrial pharmacy, Varghese publ house, Mumbai.
  4. AR. Gennerio Remington: the science and practice of pharmacy, vol 1 & 2 Lippincott Williams & wilkins, Philadelphia, 2004.
  5. Robert E notary, Biopharmaceutics and pharmacokinetics – an introduction, arcel dekker inc., NY
- L. Shargel and ABC Yu, textbook of applied biopharmaceutics & pharmacokinetics, 4<sup>th</sup> edn. Appleton – century – crofts. Connecticut, 2004.

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(R9603) PHARMACOLOGY – III

**UNIT-I**

**Drugs Acting on the Gastrointestinal Tract**

- Antacids, Antisecretory and Anti ulcer Drugs
- Laxatives and antidiarrhoeal drugs
- Appetite Stimulants and Suppressants.
- Emetics and anti emetics
- Miscellaneous; Carminatives, demulcents, protectives, adsorbents, astringents, digestants, enzymes and mucolytics.

[www.engineershub.in](http://www.engineershub.in)

**UNIT-II**

**Chemotherapeutic agents and their applications :**

- General principles of chemotherapy.
- Sulphonamides and co trimoxazole.
- Antibiotics: Penicillins, cephalosporins, betalactams,

**UNIT-III**

**Chemotherapeutic agents and their applications :** Tetracyclines aminoglycosides, chloramphenicol, erythromycin, quinolones and miscellaneous antibiotics.

**UNIT-IV**

Chemotherapy of tuberculosis & leprosy.

**UNIT-V**

Chemotherapy of fungal diseases, viral diseases, urinary tract infections and sexually transmitted diseases.

**UNIT-VI**

Chemotherapy of malignancy and immunosuppressive Agents.

**UNIT-VII**

**Principles of Toxicology :** Definition of poison, general principles of treatment of poisoning with particular reference to barbiturates opioids, organophosphorous and atropine poisoning.

**UNIT-VIII**

**Drugs used for contraception.**

Heavy metals and heavy metals antagonists. Diagnostic Agents.

**TEXT BOOKS**

- Sathoskar, Pharmacology and pharmaco therapeutics, Vol. 1 & 2, Publ by Popular Prakashan, Mumbai.
- Bertram. G. Katzung, Basic and clinical pharmacology
- Tripathi, Textbook of Pharmacology.
- Rang & Dale, Textbook of Pharmacology.

**REFERENCE BOOKS**

- J.G. Hardman and Lee E. Limbard, Good Mann & Gilmann: The Pharmacological basis of therapeutics, Mc Graw hill, Health Professions Dvn.
- H.P Rang, M. M. dale & J.M. Ritter, Pharmacology, Churchill Living stone, 4<sup>th</sup> Ed.
- J. Crossland, Lewis 's Pharmacology, Church living stone.
- P. Jagadish Prasad, Conceptual Pharmacology – Universities Press.
- Screening Methods in Pharmacology I Vol.set TURNER, Elrevier.

[www.engineershub.in](http://www.engineershub.in)

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**(R9604) MEDICINAL CHEMISTRY – II**

**UNIT – I**

Drug discovery and drug design. [www.engineershub.in](http://www.engineershub.in)

Introduction to discovery of lead molecule, lead optimization, pharmacophore identification, General structure activity relationship studies.

**UNIT – II.**

**Computer aided drug design:** Introduction to CADD, Parameters in QSAR, Applications of Hansch analysis, Free Wilson analysis

**UNIT – III**

**Antibiotics :** Brief historical background, definition, classification of antibiotics.

**Penicillins :** Historical background and biological sources. Structures of different penicillins.

**Reactions :** Hydrolysis of penicillin by cold and hot dilute mineral acid, alkali, enzymatic hydrolysis with Penicillinase, amidase.

**Classification :** Oral and parenteral, based on spectrum of  $\beta$ -lactamase, as natural, biosynthetic and activity and resistance to semi-synthetic.

General method of synthesis of penicillins from 6-APA, SAR, mechanism of action, therapeutic uses, toxicity.  $\beta$ -lactamase inhibitors. A note on

**UNIT – IV**

**Cephalosporins :** Biological sources. Structures of some important Cephalosporins and Cephamycins. Acid hydrolysis of Cephalosporin C. Comparison of 6-APA and 7-ACA, penam and cepham.

**Classification :** Generations of cephalosporins. Oral and parenteral. SAR and Advantages over penicillins.

**UNIT – V**

**Tetracyclins :** Biological sources, structures of the important tetracyclines, important structural units and the three acidity constants in the tetracycline molecule, Amphoteric nature, mechanism of action, spectrum of activity, SAR and toxicity.

**UNIT – VI**

**Aminoglycosides :** Structure of streptomycin, acid hydrolysis, mechanism of action, therapeutic uses and toxicity. Dihydrostreptomycin and its importance. A mention of other aminoglycoside antibiotics.

A brief account of chloramphenicol and its synthesis, macrolide and polypeptide antibiotics and Rifampicin (Structures not included).

**UNIT – VII**

**Immunosuppressive agents.**

[www.engineershub.in](http://www.engineershub.in)

Brief introduction to therapeutic agents developed from recombinant DNA technology

**UNIT – VIII**

Diagnostic agents and radioprotective agents.

Brief introduction to combinatorial synthesis in solid phase and liquid phase.

**TEXT BOOKS**

1. William O. Foye, Textbook of Medicinal Chemistry, Lea & Febiger, Philadelphia.
2. JH Block & JM Beale, Wilson & Giswold's Text book of organic Medicinal Chemistry and pharmaceutical chemistry by (Eds), 11<sup>th</sup> Ed, Lipincott, Raven, Philadelphia, 2004.
3. S. N. Pandeya, Textbook of medicinal chemistry, SG Publ. Varanasi, 2003.
4. Sri Ram, Medicinal Chemistry.
5. Rama Rao Nadendla, Medicinal Chemistry.

**REFERENCES**

1. D. Abraham (Ed), Burger Medicinal chemistry and Drug discovery, Vol. 1 & 2. John Wiley & Sons, New York 2003.
2. Lippincott Williams and Wilkins: Remington Pharmaceutical Sciences
3. L. M. Atherden, Bentley and Driver's Textbook of Pharmaceutical Chemistry. Oxford University Press, Delhi.
4. B.N. Lads, MG Mandel and F.I. way, Fundamentals of drug metabolism & disposition, William & welking co, Baltimore USA.
5. C. Hansch, Comprehensive medicinal chemistry, Vol 1 – 6 Elsevier pergmon press, oxford 1991.
6. Daniel lednicer, Strategies For Organic Drug Synthesis And Design, John Wiley, N. Y. 1998.
7. D. Lednicer, Organic drug synthesis, Vol. 1 – 6, J.Wiley N.Y.
8. Kadam, Textbook of Medicinal Chemistry Vol. 1 & 2
9. O.P. Agarwal, Text book of natural products by Vol. 1 & 2

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(R9605) PHARMACY ADMINISTRATION

**UNIT – I**

**Features of Business Organisations & New Economic Environment :**

Characteristic features of Business. Features and evaluation of Sole Proprietorship, Partnership, Joint Stock Company, Public Enterprises and their types, Changing Business Environment in Post-Liberalisation scenario.

**UNIT – II**

**Manufacturing Management:** Goals of Production Management and Organisation – Production, Planning and Control – Plant location – Principles and Types of Plant Layout-Methods of production (Job, batch and Mass Production), New Product Development.

**Work Study** – Basic procedure involved in Method Study and Work Measurement-Statistical Quality Control:  $\bar{X}$  chart, R chart,  $c$  chart,  $p$  chart, (simple Problems), Acceptance Sampling, Deming's contribution to quality.

[www.engineershutub.in](http://www.engineershutub.in)

**UNIT – III**

**Social Pharmacy :** a. Social uses of drugs ; Abuse of prescription drugs.

**Behavioral Pharmacy :** Compliers / Adherence to medications.

**Introduction to PharmacoEconomics :** Definitions of Efficacy ;

Comparative cost effectiveness ratios; Comparative Clinical Effectiveness and cost Benefit ratios.

**Pharmaceutical Outcomes (Quality of life concepts)**

History of Pharmaceutical out comes movements in India and abroad.

**Pharmaceovigilance / PharmacoEpidemiology :**

Present status in India ; State and Central initiatives ; Reporting of Adverse Drug Reactions ; Prescribed format for reporting Adverse Drug Reactions; Irrational Drug Combinations; List of Drugs banned by Government of India and other State Governments.

**UNIT – IV**

Organisation of Distribution and Marketing: Functions of

Marketing, Marketing Mix, Marketing Strategies based on Product Life Cycle., Channels of distribution – Factors influencing channels of distribution, sales organization and sales promotion.

**UNIT – V**

**Pharma Industry :** Growth of Pharma Industry in India – current status and its role in building national economy and national health – Structure of Pharma Industry in India – PSUs in Pharma Industry –Progress in the manufacture of basic drugs, synthetic and drugs of vegetable origin. Export and import of drugs and pharmaceuticals – Export and import Trade.

**UNIT – VI**

**Insurance and Pharma :** Various types of insurance including marine and health insurance.

**UNIT – VII**

Pharmaceutical Associations and Societies, statutory councils governing the profession. General Principles of medical detailing.

**UNIT – VIII**

**Principles of drug store and community pharmacy administration :** Drug store planning and layout, sales promotion and salesmanship in drug store. Accounting records in drug stores.

**TEXT BOOK**

1. Aryasri and Subbarao, Pharmaceutical Administration, TMH.
2. Smarta, Strategic Pharma Marketing
3. G.Vidya Sagar, Pharmaceutical Industrial Management.

**REFERENCES**

1. Subbarao Chaganti, Pharmaceutal Marketing in India – Concepts and Strategy Cases, Pharma Book Syndicate.
2. O.P.Khanna, Industrial Management, Dhanpatrai, New Delhi.

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IV Year B. Pharm I-Sem

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**(R9606) INDUSTRIAL TRAINING AND SEMINAR**

- Industrial Pharmacy
- Clinical Pharmacy/Pharmacology
- Pharmacognosy/Med. Chem.
- Pharmaceutical Analysis/Quality assurance
- Pharmaceutical Marketing

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**(R9607) PHARMACEUTICAL ANALYSIS - II LAB**

Experiments [www.engineershub.in](http://www.engineershub.in)

- Interpretation of IR Spectra of any two compounds.
- Determination of I- max of a drug.
- Assay of any two drugs by UV-spectro photometry.
- Assay of any two drugs by Colorimetric method.
- Assay of Quinine Sulphate by Flourimetry
- Ascending paper chromatography.
- Radial paper chromatography.
- Two dimension chromatography
- Thin layer chromatography.
- Column chromatography
- Paper electrophoresis of amino acids.
- Gel electrophoresis (*Demonstration Only*).
- HPLC (*Demonstration Only*).

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**(R9608) BIOPHARMACEUTICS & PHARMACOKINETICS LAB**

1. Experiments designed for the estimation of various pharmacokinetic parameters with given data
2. Analysis of biological specifications for drug content and estimation of the pharmacokinetic parameters.
3. In vitro evaluation of different dosage forms for drug release
4. Absorption studies – *in vitro* and *in vivo*.
5. Statistical treatment of pharmaceutical data.

**Reference book**

[www.engineershub.in](http://www.engineershub.in)

Dr. D. Dhachinamoorthi- Biopharmaceutical and Pharmacokinetic- A Practical Manual

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**(R9609) PHARMACOLOGY – III LAB**

1. Experiments on Isolated Preparations:
    - a. To calculate the  $PA_2$  value of atropine using acetylcholine as an agonist on rat ileum preparation.
    - b. To calculate the  $PA_2$  value of mepyramine or chlorampheniramine using histamine as agonist on guinea pig ileum.
    - c. To find out the strength of the given sample on (e.g. Acetylcholine, Histamine, 5 HT, Oxytocin etc.) Using a suitable isolated muscle preparation by
  2. Matching Assay
    - ii. Two point Assay
    - iii. Three point Assay
- [www.engineershub.in](http://www.engineershub.in)
1. Pharmacology of the Gastrointestinal Tract  
To study the anti secretory and anti ulcer activity using pylorus ligated rats.

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**(R9610) MEDICINAL CHEMISTRY – II LAB****Estimations of the following.**

1. Ascorbic acid.
2. Vitamin B1.
3. Penicillin.
4. Alkaloid (by gravimetry).
5. Phosphoric acid by volumetric method
6. Lactic acid by volumetric method
7. Salicylic acid by volumetric method
8. Ibuprofen by volumetric method
9. Aspirin by volumetric method

[www.engineersshub.in](http://www.engineersshub.in)**REFERENCES**

1. Indian Pharmacopoeia., – 1996, 4<sup>th</sup> Edition.
2. P.D.Sethi – Quantitative Analysis of Drugs and Pharmaceuticals.
3. B.G.Nagavi Lab Hand Book of Instrumental Drug Analysis.