

15CBPH71 Pharmacognosy- V (Chemistry of Natural Products)

Theory

3-0-0-3

UNIT – I Spectral structure of Natural products **12hours**
Chemical and spectral approaches to simple molecules of natural origin concept of stereo isomerism taking example of natural products

UNIT – II Biogenesis and Chemistry and Bioactive products **18 hours**
Glycosides : Chemistry and biosynthesis of digitoxin , sennosides , diosgenin and sarsasapogenin.

Alkaloids: Chemistry , biogenesis and pharmacological activity of atropine and related compounds ;quinine , reserpine , morphine , ephedrine , ergot , vinca and xanthine alkaloids.

UNIT – III Vitamins , Proteins , Carbohydrates ,Hormones , Oils , Fats and Waxes **10 hours**
Fat soluble and Water soluble vitamins:Chemistry , Biogenesis of Amino acids , proteins and peptide hormones like thyroid and insulin. Oils , fats and waxes .Chemistry of carbohydrates.

UNIT – IV Chemistry of Terpenoids and Flavanoids **12 hours**
Chemistry , biogenesis and pharmacological activity of medicinally important monoterpenes , sesquiterpenes , diterpenes , terpenoids and medicinally important lignans and quassianoids

UNIT – V Stereochemistry of Steroids and related Drugs **8 hours**
Steroidal nomenclature and stereochemistry , androgens and anabolic agents , estrogens, progestational agents , adrenocorticoids , cholesterol , ergosterol , bileacids

Total : 60 hours

Course Outcomes

At the end of the course, the student will be able to

- CO1:** Analyze simple molecules of natural origin by chemical and spectral approaches to understand the concept of stereo isomerism taking example of natural products
- CO2:** Develop knowledge on chemistry, biogenesis and pharmacological activity of bioactive secondary metabolites viz. alkaloids (quinine, reserpine, morphine, ephedrine, ergot, vinca and xanthine) and glycosides (digitoxin, sennosides, diosgenin and sarsasapogenin).
- CO3:** Explain the chemistry of vitamins, proteins, carbohydrates, hormones, oils, fats and waxes.
- CO4:** Outline the chemistry, biogenesis and pharmacological activity of medicinally important monoterpenes, sesquiterpenes, diterpenes, terpenoids , medicinally important lignans and quassianoids.
- CO5:** Elaborate the steroidal nomenclature and stereochemistry of androgens and anabolic agents, estrogens, progestational agents, adrenocorticoids, cholesterol, ergosterol, bile acids

Practicals**0-0-3-2**

1. Isolation of caffeine from tea leaves
2. Isolation of casein from milk
3. Isolation of starch from potato
4. Isolation of pectin from orange peel and lemon peel
5. Isolation of citric acid from lemon fruits
6. Isolation of Lawsons from henna leaves
7. TLC of senna glycosides

8. TLC of Datura alkaloids
9. Paper chromatography of amino acids
10. Determination of iodine value
11. Determination of Saponification value
12. Determination of Acid value and Peroxide value

Total - 45 hours

Course Outcomes

At the end of the course, the student will be able to

- CO1:** Experiment with the isolation of caffeine, starch and casein from crude drugs and identify using suitable chemical test.
- CO2:** Experiment with the isolation of pectin, calcium citrate and lawsone from crude drugs and identify using suitable chemical test.
- CO3:** Analyze the glycosides and alkaloids in crude drugs using Thin layer chromatography.
- CO4:** Analyze the various amino acids using paper chromatography.
- CO5:** Determine the iodine value, saponification value, peroxide value and acid value in fats and oils as per standard procedure.

Text books

1. Pharmacognosy. William Charles Evans, W. B. Saunders, Edinburg London New York Philadelphia St. Louis Sydney Toronto 15 th edition2002.
2. Pharmacognosy: V. E. Tyler, L. R. Brady, J. E. Habbers, Lea and Febiger Philadelphia, 9th Edition, 1988.
3. Modern Pharmacognosy. Egil Ramstad, McGraw-Hill Book Company, London, New York, Toronto.
4. Chemistry of Natural products – O.P.Agarwal,Krishna prakashan 34 th edition 2007
5. Natural product chemistry: At a glance Stanforth Stephen. Blackwell,1997

Reference Books

1. Laboratory Handbook for the fractionationation of Nattutal extracts by Peter Houghton and Amala Raman, Chapman & Hall Madras, 1998.
2. Biochemistry – Harold Varley. 4th edition 1969
3. Herbal Drug Industry R.D. Chowdary. Londan 3 rd edition 1985
4. Pharmacognosy and Pharmaco biotechnology –, James Robbers Mary Lyn., K Speedy and Varro, E. Tylor.Wolters klcewer. 10 th edition 1988
5. Text book of Organic Medicinal and Pharmaceutical chemistry by Wilson and Giswold Doerge Lippincott Williams, Wilkins, 12 th edition 2010
6. : Phytochemical Methods, J.B. Harborne Chapman and Halls, London.1984
7. Drug analysis by chromatography and microscopy Egon Stahl Ann arbor science publishers,1973
8. Plant drug analysis ,Athin layer chromatography ,Atlas , Hildehert Wagner & Sabine Bladt

,Berlin Heidebey 1996

9. Natural products: A Laboratory Guide Raphael Ikan,Academic press, 2 nd edition. 1974

15CBPH72 PHARMACEUTICS-VIII (PHARMACEUTICAL TECHNOLOGY II)

THEORY

2-0-0-2

Unit I : Capsules:

9hrs

Advantage and disadvantages of capsule dosage form material for production on hard gelatin capsules, size of capsules, method of capsule filling, soft gelatin capsule shell and capsule content, importance of base absorption and minimum/gm factors in soft capsules, quality control, stability testing and storage of capsule dosage forms.

Unit II : Micro encapsulation:

9hrs

Types of microcapsules, importance of microencapsulation in pharmacy, microencapsulation by phase separation co-acervation multi orifice, spray drying, spray suspension technique coating pan and other techniques, evaluation of micro capsules.

Unit III : Tablets

9hrs

(a) Formulation of different types of tablets of, granulation technology on large-scale by various techniques, physics of tablets making different types of tablet compression machinery and the equipments for coating, coating process evaluation of coated tablets.

(b) Formulation details, containers and closures and selection.

Unit IV: Parenteral products:

9hrs

(a) Preformulation factors, routes of administration, water for injection, pyrogenicity, non aqueous vehicle isotonicity and methods of its adjustment.

(b) Formulation details, containers and closures and selection.

(c) Prefilling treatment, washing of containers and closures, preparation of solution and suspensions filling and closing of ampoules, vials, infusion fluids, lyophilization & preparation of sterile powders, equipment for large scale manufacture and evaluation of parenteral products.

(d) Aseptic techniques, source of contamination and methods of prevention, design of aseptic area, Laminar flow bench services and maintenance.

(e) Sterility testing of Pharmaceuticals.

Unit V : Novel drug delivery systems

9hrs

Liposomes, nanoparticles, ocuserts, transdermal systems. Packaging of Pharmaceutical products

Packaging components, types, specifications and methods of evaluation, stability aspects of packaging.

Packaging equipments, factors influencing choice of containers legal and other official requirements for containers, package testing.

Total hrs

45hrs

Course Outcomes

At the end of the course, the student will be able to

CO1: Acquire knowledge on capsules.

CO2: Understand the basic concept of microencapsulation techniques in pharmacy.

CO3: Acquire knowledge on tablets granulation, formulations and coating process.

CO4: Categorize different parenteral products and their Preformulation techniques, formulations procedures.

CO5: Explain novel drug delivery systems and discuss importance of packaging of pharmaceutical products.

Practicals**0-0-2-1**

1. Preparation, stabilization and evaluation of: powders
2. Preparation, stabilization and evaluation of: capsules
3. Preparation, stabilization and evaluation of: tablets
4. Preparation, stabilization and evaluation of: parenterals
5. Preparation, stabilization and evaluation of: micro capsules
6. Preparation, stabilization and evaluation of: trasdermal patches
7. In process quality control for: tablets
8. In process quality control for: capsules
9. In process quality control for: powders
10. In process quality control for: packaging testing
11. In process quality control for: leak and LAL test
12. In process quality control for: parental test

Course Outcomes

At the end of the course, the student will be able to

- CO1:** Understand the different formulation and evaluation of solid dosage forms.
- CO2:** Acquire knowledge on parenterals and different techniques for preparation and evaluations.
- CO3:** Categorize in process quality control test for solid dosage forms.
- CO4:** Examine in process quality control test for packaging testing, leak test and LAL test.
- CO5:** Determine in process quality control test for parenterals.

Textbooks:

1. Theory and Practice of Industrial Pharmacy ,Lachman, Philadelphia, Lea & Febiger, 3rd edition, 1976.

2.Pharmaceutical dosage forms: Disperse systems , Liberman and Lachman, Marcel Dekker ,new york, 2nd edition, 1992

Reference Books:

1. Pharmaceutical dosage forms: Tablets, Liberman and Lachman, . Marcel Dekker, New York, 2nd edition, 1989
2. Pharmaceutical dosage forms: Parenteral medications , Liberman and Lachman , Marcel Dekker 2nd edition,1993.
3. Remington's Pharmaceutical Sciences (RPS). Deno, Gennaro, Gibson, Harvey, King, Martin, Swinyard, Van Meter, Witlin, Osoi, Hoover Chase , Mack Pub, 16 edition ,1980
4. Modern Pharmaceutics,Banker and Gilberts, marcel dekker, new york4th edition, 1979
5. Hard Capsules , Ridgway, Jackson W. A. Ching's worm ,K. Pharmaceutical Press London, Wiley-Interscience, 3rd edition ,2004 .

Course Objective:

The course is designed to impart the knowledge in the field of Pharmacology with emphasis on the principles of chemotherapy, antibiotics, chemotherapy of tuberculosis, leprosy and fungal diseases, drugs acting on the gastrointestinal tract, pharmacology of endocrine system and treatment of poisoning.

Theory**3-0-0-3****Unit I: Drugs Acting on the Gastrointestinal Tract** **12 hrs**

Antacids, Anti secretory and Anti-ulcer drugs, Laxatives and antidiarrhoeal drugs, Appetites stimulants and Suppressants, Emetics and anti-emetics. Miscellaneous: Carminatives, demulcents, protectives, adsorbents, astringents, digestants, enzymes and mucolytics.

Unit II: Pharmacology of Endocrine System **12 hrs**

Hypothalamic and pituitary hormones, Thyroid hormones and anti thyroid drugs. Parathormone, calcitonin and Vitamin D. Insulin, oral hypoglycemic agents and glucagon. ACTH and corticosteroids. Androgens and anabolic steroids. Estrogens, progesterone and oral contraceptives. Drugs acting on the uterus.

Unit III: Chemotherapy I **12 hrs**

General principles of chemotherapy. Sulfonarnides and cotrimoxazole. Antibiotics: Pencillins Cephalosporins, Aminoglycosides, Tetracyclines, Chloramphenicol, Macrolides, Quinolones and Miscellaneous antibiotics

Unit IV: Chemotherapy II **12 hrs**

Chemotherapy of tuberculosis, leprosy, fungal Diseases, viral diseases, urinary tract infections and sexually transmitted diseases. Chemotherapy of malignancy and Immunosuppressive Agents.

Unit V: Treatment of Poisoning **12 hrs**

Definition of poison, general principles of treatment of poisoning with particular reference to barbiturates, opioids, organophosphorous and atropine poisoning. Heavy metals and heavy metal antagonists.

Total **60 hrs**

Course Outcomes

At the end of the course, the student will be able to

- CO1:** Classify the drugs and summarize the mechanism of action, ADR and therapeutic uses of various drugs on gastrointestinal tract
- CO2:** Apply the pharmacology of endocrine system in various hormonal imbalance disorders
- CO3:** Categorize the various chemotherapy agents based on structure, mechanism and list the chemotherapy drugs contraindicated in pregnancy and lactation women's
- CO4:** Explain the importance of drugs used in treatment of Cancer, tuberculosis, leprosy, fungal Diseases, viral diseases, UTI, STD & immunosuppressive agents
- CO5:** Elaborate the symptoms and treatment of various drug poisoning and heavy metal poisoning

1. Introduction to *in vitro* pharmacology
2. Laboratory animals used in pharmacology
3. Commonly used drugs in *in vitro* pharmacology
4. Study the physiological salt solution used in various *in vitro* pharmacology
5. *In vitro* tissue equipment organ bath and levers
6. Study the agonist and antagonist activity of acetylcholine and atropine using chickum ileum preparation
7. Study the agonist and antagonist activity of histamine and mepyramine using chickum ileum preparation.
8. Estimate the strength of the test sample (Ach) by matching bioassay using isolated chicken ileum preparation.
9. Estimate the strength of the test sample (Histamine) by bracketing bioassay using isolated chicken ileum preparation.
10. Estimate the strength of test sample by three point bioassay using isolated chicken ileum preparation.
11. Estimate the strength of test sample by four point bioassay using isolated chicken ileum preparation.
12. Study the antisecretory and antiulcer activity using pylorus ligated rats.

Course Outcomes

At the end of the course, the student will be able to

- CO1:** Summarize the equipment's, animals and drugs used in experimental pharmacology and Physiological salt solution used in *in vitro* pharmacology.
- CO2:** Compare the agonist and antagonist action of muscarinic and histaminic agents acting on isolated chicken ileum preparation
- CO3:** Estimate the concentration of unknown sample of acetylcholine and histamine using matching and bracketing bioassay using isolated chicken ileum preparation
- CO4:** Estimate the concentration of unknown sample of drugs using multiple point bioassay (3 point and 4 point) using isolated chicken ileum preparation
- CO5:** Test the antisecretory and antiulcer activity of drugs using pylorus ligated rats with the help of standard scores of the ulcer

Textbooks

1. Pharmacology and Pharmacotherapeutics by R. S. Satoskar and S. D. Bhandarkar, 21st edition, Popular prakashan, 2009.
2. Essentials of Medical Pharmacology by K. D. Tripathi, 7th edition, Jaypee brothers medical publishers, 2013.
3. Hand book of Experimental Pharmacology by S. K. Kulkarni, Published by Vallabh prakashan, 2015.

Reference Books

1. Pharmacology. Rang and Dale, 8th edition, Published by Elsevier, 2015.
2. The Pharmacological basis of therapeutics, Goodman and Gillman, 12th edition, Published by McGraw-Hill Education, 2011.
3. Modern Pharmacology by Charles R Craig, & Robert E. Stitzel, 5th edition, Published by Lippincott Williams & Wilkins, 2003.
4. Pharmacology by Michelle A. Clark, Richard Finkel, Jose A. Rey, Karen Whalen, 5th edition. Published by Wolters Kluwer, 2014
5. Review of pharmacology by Gobind Rai Garg, Sparsh Gupta, 9th Edition, Published by Jaypee, 2015.

Course Objective:

Pharmaceutical Biotechnology is the therapeutic application of Biotechnology that uses biological systems, living organisms, or derivatives thereof, to make or modify the drugs from various sources as well as to help us in the area of disease diagnosis, tissue engineering and develop transgenic plants and animals with added therapeutic values.

Theory**3 0 0 3****Unit I: Immunology and Immunological Preparations:****12 hrs**

Principles, antigens and haptens, immune system, cellular humoral immunity, immunological tolerance, antigen-antibody reactions and their applications. Hypersensitivity, Active and passive immunization, vaccines and sera, their preparations standardization and storage.

Unit II: Genetic Recombination:**12 hrs**

Transformation, conjugation, transduction, protoplast fusion and gene cloning and their applications. Development of hybridoma for monoclonal antibodies. Study of drugs produced by biotechnology such as activase, Humulin, Humatropin, HB etc.

Unit III: Antibiotics:**12 hrs**

Historical development of antibiotics. Antimicrobial spectrum and methods used for their standardization. Screening of soil for organisms producing antibiotics, Fermenter and its design, control of different parameters. Isolation of mutants, factors influencing rate of mutation. Design of fermentation process isolation of fermentation products with special reference to penicillins, streptomycins tetracyclines and vitamin B12.

Unit IV: Microbial Transformation:**12 hrs**

Introduction, types of reactions mediated by microorganisms, design of biotransformation processes, selection of organisms, biotransformation process and its improvements with special reference to steroids.

Unit V: Enzyme immobilization:**12 hrs**

Techniques of immobilization of enzymes, factors affecting enzyme kinetics. Study of enzymes such as hyaluronidase, penicillinase, streptokinase and streptodornase, amylases and proteases etc. immobilization of bacteria and plant cells.

Total**60 hrs****Course Outcomes**

At the end of the course, the student will be able to

- CO1:** Illustrate the immune system, Classify the immunity, immunological tolerance; Explain the different types of antigen-antibody reactions and their applications. Outline the Hypersensitivity types , Active and passive immunization, vaccines and sera, their preparations standardization and storage.
- CO2:** Apply the genetic engineering principles Transformation, conjugation, transduction, protoplast fusion and gene cloning and their applications. Develop the hybridoma for monoclonal antibodies Production . utilize the genetic engineering for the production of biotechnology products such as activase, Humulin, Humatropin, Hepatitis B
- CO3:** Discover of antibiotic from different micro-organisms and Analyze the potential of antibiotic screening. Design of the Fermenter and its parameters. Examine the mutation .classify the factors influencing rate of mutation. Production of fermentation products penicillins, streptomycins tetracyclines and vitamin B12
- CO4:** Explain the types of reactions mediated by microorganisms, interpret the biotransformation processes, Determine the selection of organisms to involve in biotransformation process and with special reference to steroids.
- CO5:** Develop the different Techniques in immobilization of enzymes; Discuss the factors affecting enzyme kinetics. Elaborate the study of enzymes such as hyaluronidase, penicillinase, streptokinase and streptodornase, amylases and proteases etc. Discuss the immobilization of bacteria and plant cells.

Textbooks

1. Text Book of Immunology, BS Nagoba, DV Vedpathak. 1st edition Paras Medical Publisher, Hyderabad, 2003.
2. Textbook of Microbiology, D.R.Arora.2nd ed, publisher CBS Publishers, 2003.

Reference Books

1. Immunology, I Kannan.Ist ed, Year of Publication 2010.
2. Immunology, Dasgupta Anil. Publishing Year: 2007.
3. Pharmaceutical Biotechnology,S.P. Vyas,V.K. Dixit.Ist ed Published by CBS Publishers & Distributors Pvt. Ltd., 2010.
4. Principles of Gene Manipulation, Sandy B. Primrose , Richard Twyman, Bob Old Publisher: Wiley-Blackwell; 6th Edition (8 December 2001).
5. A Textbook of Biotechnology, R C Dubey. S. Chand Publishing 1993.

15CBPH75 Pharmacology – IV (Clinical Pharmacy & Pharmacotherapeutics)

Course objective:

Clinical pharmacy and pharmacotherapy is designed with an objective to provide patient care that optimizes medication therapy and promotes health, wellness, and disease prevention. To learn to blend caring orientation with specialized therapeutic knowledge, experience, and judgment so that optimal patient outcomes are ensured. To be a primary source of scientifically valid information and would be able to advice regarding the safe, appropriate, and cost-effective use of medications.

Theory

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Unit I: Basic concepts of Pharmacotherapy

12 hrs

- a) Introduction to Clinical Pharmacy.
- b) Drug use during infancy and in the elderly (Paediatrics & Geriatrics)
- c) Drug use during pregnancy
- d) Drug induced diseases
- e) Drug interactions
- f) General principles of clinical toxicology
- g) Interpretation of clinical laboratory tests.

Unit II: Important disorders of Organ Systems and their Management	12 hrs
a) Cardiovascular Disorders: Hypertension. Congestive Heart Failure. Angina. Acute Myocardial Infarction. Cardiac Arrhythmias factors.	
b) CNS disorders: Epilepsy. Parkinsonism. Schizophrenia depression	
c) Respiratory disease: Asthma. COPD	
d) Gastrointestinal disorders: Peptic Ulcer disease. Hepatitis drug induced liver disorders.	
Unit III: Important disorders of Organ Systems and their Management	12 hrs
a) Musculoskeletal disorders: Rheumatoid arthritis. Osteoarthritis gout	
b) Endocrine disorders: Diabetes Mellitus and Thyroid disorders.	
c) Haemopoietic disorders: Anemias.	
d) Renal diseases - acute and chronic renal failure	
Unit IV: Infectious Diseases	12 hrs
a) Tuberculosis.	
b) Urinary Tract Infection	
c) Enteric Infections.	
d) Upper Respiratory Infections.	
e) STD – AIDS, Syphilis, Gonorrhoea.	
Unit V: Neoplastic Diseases	12 hrs
Acute Leukaemias	
Total	60 hrs

Course Outcomes

At the end of the course, the student will be able to

- CO1:** Explain the principles of clinical toxicology
- CO2:** Identify the cardiovascular, CNS ,respiratory disorders and their managements
- CO3:** Distinguish the differences between acute and chronic renal disease
- CO4:** Explain the urinary tract infection and upper respiratory infections
- CO5:** Elaborate the neoplastic diseases

Practicals **0-0-3-2**
 Drug therapy, dosage schedules, drug interactions, adverse effects, contraindications, preparations available, cost effectiveness for the following

- a) Hypertension, Congestive cardiac failure
- b) Ischemic heart diseases
- c) Asthma and COPD
- d) PUD

- e) DM
- f) TB and Respiratory infections
- g) RA
- h) ARF
- i) epilepsy
- j) Medical terminologies related to case presentations
- k) Biochemical investigations
- l) Patient counseling

Course Outcomes

At the end of the course, the student will be able to

- CO1:** Explain the hypertension and congestive cardiac failure
- CO2:** Identify the Ischemic heart diseases and their managements
- CO3:** Distinguish the differences between TB and Respiratory infections
- CO4:** Explain the medical terminologies related to case presentations
- CO5:** Examine the biochemical investigations

Textbooks

1. Clinical pharmacy and therapeutics, Roger and Walker, 4th edition, Churchill Livingstone, 2007.
2. Comprehensive pharmacy review, Leon Shargel, 7th revised edition, Springhouse Publishing, 2009.
3. Pathophysiology, Harsh Mohan, 7th revised edition, Jaypee Brothers Medical Publishers, 2014.

Reference Books

1. Pharmacotherapy- a pathophysiological approach, Joseph T. Dipero et al, 9th edition, McGraw-Hill Education / Medical, 2014.
2. Clinical pharmacy and therapeutics, Eric T. Herfindal, 5th revised edition, Lippincott Williams and Wilkins, 1992.
3. Pathology and Therapeutics for Pharmacists: A Basis for Clinical Pharmacy Practice, Russell J. Greene et al, 3rd edition, Pharmaceutical Press, 2008.
4. Applied Therapeutics: The Clinical Uses of Drugs, Koda and Kimble, 10th Edition, Lippincott, 2012.
5. Bedside Clinics in Medicine, Kundu, A.K., Part-I and II, 6th edition, Academic Publishers, 2009.

6. Oxford Textbook of Medicine, David A. Warrell et al, 5th edition, Blackwell Science, 2010.
7. Harrison's Principles of Internal Medicine, Anthony S. Fauci et al, Vol-I And II, 17th edition, Mc Graw-Hill, 2008.