

15CBPH51- PHARMACEUTICAL CHEMISTRY – IV (BIOCHEMISTRY)

Course Objective:

The course is designed to impart the knowledge in the field of Pharmaceutical biochemistry. The various biochemical aspects of carbohydrates, lipids and fats are taught to enable the students to understand the basic metabolic pathways, diseases and its diagnostic tests. In addition to the theoretical aspects, the basic practical knowledge relevant to the biochemical estimation is also imparted.

Theory

3-0-0-3

Unit I: Cell, transport Across membrane and Enzymes

12 hrs

Biochemical organization of the cell- Transport processes across cell membrane. Classification, properties and biomedical importance of:

(a) Carbohydrates (b) Lipids (c) Proteins and amino acids (d) Nucleic acids (e) Hemoglobin

Enzymes: Classification

(a) Mechanism of action, factors affecting enzyme activity (b) Enzyme inhibition (c) Enzymes and isoenzymes in clinical diagnosis (d) Coenzymes.

Vitamins:

Chemistry, sources, RDA, function, deficiency manifestations, hypervitaminosis - antivitamin - assays.

Unit II: Chemistry and metabolism of Carbohydrates

12 hrs

Digestion and absorption of carbohydrates.

Metabolism of carbohydrates - Glycolysis - Citric acid cycle Glycogen metabolism

- Glycogen storage diseases - Gluconeogenesis Outlines of Hexose monophosphate shunt and uronic acid pathway Metabolism of fructose and galactose

Blood sugar regulation - Glucose tolerance test.

Unit III Chemistry and metabolism of Lipids

12 hrs

Digestion and absorption of lipids. Metabolism of lipids - Oxidation of fatty acids Biosynthesis of fatty acids - Formation and utilization of ketone bodies. Biosynthesis and degradation of cholesterol, Outlines of hypoprotein metabolism. Lipids storage disease Essential fatty acids - lipotropic factors.

Unit IV: Chemistry, metabolism of Nucleotides and Proteins

12 hrs

Digestion and absorption of proteins. Metabolism of proteins. Disposal of amino groups and carbon skeleton of amino acids urea cycle and its metabolic disorders metabolism of essential and non essential amino acids with special reference to Glycine. sulphur containing amino acids and Aromatic amino acids.

Outline of biosynthesis and catabolism of purine and pyrimidine nucleotides - uric acid formation - Gout. Outline of biosynthesis of porphyrins and hemoglobin - formation of Bile pigments - Jaundice.

Unit V: DNA replication and genetic engineering

12 hrs

Genetic organization of mammalian genome, DNA replication, protein biosynthesis Transcription, Genetic code, Translation Regulation of genetic expression. mutation - DNA repair - Carcinogenesis PCR genetic engineering (Recombinant DNA Technology), Important inborn errors of metabolism.

Total

60 hrs

Course Outcomes

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

- CO1: Outline the reactions of carbohydrates, Colour reaction of proteins. Identify the normal and abnormal constituents of Urine
- CO2: Experiment with the analysis of milk and estimate the glucose and urea in blood
- CO3: Experiment with the identification of amino acids by using paper chromatography
- CO4: Estimate the amount of creatinine, bilirubin and calcium in serum
- CO5: Estimate the titratable acidity and ammonia in urine

Practicals

0-0-3-3

1. Reaction of carbohydrates.
2. Colour reactions of proteins
3. Identification of constituents of normal urine.
4. Identification of constituents of abnormal urine.
5. Analysis of milk.
6. Estimation of glucose in blood
7. Estimation of urea in blood
8. Identification of amino acids by chromatography
9. Estimation of creatinine in serum
10. Estimation of bilirubin in serum
11. Estimation of calcium in serum
12. Estimation of titrable acidity and ammonia in urine

Course Outcomes

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

- CO1:** Plan the synthetic procedures of some important medicinal compounds
- CO2:** Explain the principle, procedure to estimate the actual amount of drug present in given powder/ Formulation
- CO3:** Interpret the impurity profile of official listed drugs by performing Monograph Analysis
- CO4:** Define partition coefficient and illustrate the determination of partition coefficient using different solvent system

Textbooks

1. Biochemistry for the Pharmaceutical Sciences, Charles P. Woodbury, Jones & Bartlett publisher, 2011
2. Biochemistry, Dr. U. Satyanarayana, 4th edition, Reed Elsevier, 2013.

Reference Books

1. Biochemistry, Keshav Trehan, New age International 1990.
2. Text book of medical biochemistry ,S.N Chaterjea, 8th,Jaypee,
3. Helpline in biochemistry,harbans Lal, PeePee publishers and distributors,2008
4. Text book of biochemistry for dental students, D.M.Vasudevan,2nd edition, jaypee brothers,2011
5. Pharmaceutical biochemistry, Harbans lal, CBS Publishers and distributor, 2008
6. Textbook of biochemistry, P.Ramamoorthy, K.G.Saur,1998

15CBPH52 PHARAMCEUTICS- VI (PHARMACEUTICAL TECHNOLOGY I)

Course Objective:

The objective of the course is to design and impart the knowledge in the field of Pharmaceutics. It deals with different dosage form of drugs other important topics like cosmetology and nuclear pharmacy are taught to enable the students to understand the principles involved in the determination of different dosage form of drugs and their formulation. In addition to the theoretical aspects, the basic practical knowledge relevant to this field is also imparted.

2-0-0-2

THEORY

Unit I : Liquid dosage forms:

9hrs

Introduction to various types of additives used in formulation of liquid dosage forms Vehicles, stabilizers, preservatives, suspending agents, emulsifying agents, solubilizers, colors, flavors and others, manufacturing packaging and evaluation of clear liquids suspensions and emulsions official in pharmacopoeia.

Unit II : Semisolid dosage forms:

9hrs

Definitions, types, mechanisms of drug penetration, factors influencing penetration semisolid bases and their selection. General formulation of semisolids, clear gels manufacturing procedure, evaluation and packaging

Ophthalmic preparations:

Requirements, formulation, methods of preparation containers, evaluation

Unit III : Extraction and galenical products:

9hrs

Principle and method of extraction, preparation of infusion, tinctures, dry soft liquid extracts. Pharmaceutical aerosols : Definition , propellants , general formulation, manufacturing and packaging Methods , pharmaceutical applications.

Unit IV : Cosmetology and Cosmetic Preparations:

9hrs

Fundamentals of cosmetic science, structures and functions of skin and hair. Formulation, preparation and packaging preparations like nail polish, lipsticks, baby care products shampoos, hair dressings, sunscreens etc.

Unit V : Nuclear Pharmacy:

9hrs

Introduction to Radio pharmaceuticals, radio active half life, Units of radio activity, production of radio pharmaceuticals, methods of isotopic tagging, preparation of radio isotopes in laboratory using radiation dosimetry, Radio isotope generators, permissible radiation dose level radiation hazards and their prevention, specifications for radio active laboratory.

Total hrs

45hrs

Course Outcomes

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

- CO1:** Classify different types of additives used in liquid dosage form and explain each type with examples. Demonstrate the manufacturing packaging materials and for official tests in Pharmacopoeial preparation of suspensions and emulsions.
- CO2:** Make Use of studying in variety of semisolid dosage forms and ophthalmic preparation, their formulation, various parameters, packaging requirements and identify factors influencing penetration in selection of semisolid bases.
- CO3:** Classify types of extraction methods for different galenicals. List out the general formulation procedures for propellants with their manufacturing, packaging methods and applications.
- CO4:** Determine and evaluate formulation and packaging preparation of cosmetic products. Explain the fundamentals in cosmetic science and examine the structures and function of skin and hair.
- CO5:** Discuss about the production of Radioactive Pharmaceuticals, radioactive dosimetry and isotopic tagging methods. Elaborate about the radiation hazards, specifications and prevention methods which should be followed in radioactive laboratory.

Practical

0-0-2-1

1. Preparation of Eye drops and test for sterility
2. Preparation of Eye ointments and test for sterility
3. Preparation of Suspensions and emulsions and evaluation of their stability
4. Preparation of ointment, creams and their evaluation
5. Preparation of Cold cream
6. Preparation of vanishing cream
7. Preparation of face powder
8. Preparation of tooth powder
9. Preparation of shaving cream
10. Preparation of sun screen lotion
11. Preparation of tooth paste
12. Preparation of nail colour

Course Outcomes

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

- CO1:** Demonstrate the formulation of suspension and emulsion and perform the experiment with their stability parameters.
- CO2:** Develop the eye drops, eye ointment formulation and perform the sterility test.
- CO3:** Develop cold cream, vanishing cream, shaving cream formulation.
Develop and evaluate the ointment and creams.
- CO4:** Formulate the preparation of tooth powder and face powder.
- CO5:** Formulate the sunscreen lotion, tooth paste and nail colour.

Textbooks:

1. Introduction to Pharmaceutical dosage forms, Ansel H.C,K.M. Varghese and Co, Bombay. Lea & Febiger, 4th edition,1985
2. Harry's Cosmeticology,aniel DR, Scher RK, New York: Chemical Publishing, .8th edition 1982

Reference

1. Pharmaceutics – The Science of Dosage form Design, Aulton M.E, ELBS/Churchill Livingstone,4th edition,2013
2. Dispensing for Pharmaceutical Students, Cooper and Gunn's ,CBS publishers, Delhi,2nd edition,2008
3. Tutorial Pharmacy,Carter S.J., Cooper and Gunn's CBS Publishers, Delhi. 6th Edition, 1996,
4. The Science and Practice of Pharmacy, Remington's Mack Publishing Co., Easton. . (A.R. Gennaro, ed.), 19th edition,1995
5. Pharmaceutical Dosage form and Drug Delivery Systems, Lea and Febiger ,Williams & Wilkins Philadelphia Lippincott, New York. 8th edition ,2011
6. Cosmetic Science and Technology, Vol-1-3. Sagarin & Balsam M.S, John Wiley sons, 2nd edition , 1972
7. Pharmaceutical calculation, Stoklosa MJ, Lea and Febiger, Philadelphia. 11th edition ,2001

15CBPH53**Pharmacology-I****Course Objective:**

This subject will provide an opportunity for the student to learn about the drug with regard to classification, pharmacodynamic and pharmacokinetic aspects, adverse effects, uses, dose and route of administration, precautions, contraindications and drug interaction. In this subject, apart from general pharmacology, drugs acting on autonomic nervous system, central nervous system will be taught to students. Upon completion of the subject student shall be able to understand the pharmacological aspects of drugs falling under the above mentioned chapters; appreciate the importance of pharmacology subject as a basis of therapeutics, correlate and apply the knowledge therapeutically.

Theory**3-0-0-3****Unit I: General Pharmacology****12 hrs**

Introduction to pharmacology, sources of drugs, dosage forms and routes of administration, mechanism of action, combined effect of drugs, factors modifying drug action, tolerance and dependence, Pharmacogenetics. Absorption, distribution, metabolism and excretion of drugs, principles of basic treatment of poisoning, drug interactions, biological standardization, discovery and development of new drugs.

Unit II: Neurohumoral transmission of Nervous system:**12 hrs**

1. Neurohumoral transmission in the Peripheral nervous system (autonomic and somatic)
2. Neurohoumoral transmission in the Central nervous system

Unit III: Pharmacology of Peripheral (Autonomic) Nervous Systems:**12 hrs**

1. Receptor, types of receptor, molecular mechanism of drug action, transduction mechanism by G protein coupled receptors and ion channels.
2. Definition, classification, mechanism of action, pharmacological action, ADR,

therapeutic uses of

- a) Parasympathomimetics & Parasympatholytics
- b) Sympathomimetics & Adrenergic neuron blocking agents.
- c) Ganglionic stimulants and blocking agents.

Unit IV: Pharmacology of Peripheral (somatic) Nervous Systems: 12 hrs

Definition, classification, mechanism of action, pharmacological action, ADR, therapeutic uses of

- a) Neuromuscular blocking agents.
- b) Local anaesthetic agents.

Unit V: Pharmacology of Central Nervous System: 12 hrs

Definition, classification, mechanism of action, pharmacological action, pharmacokinetics, ADR, therapeutic uses, contraindication, drug interaction and poisoning (if) of

- a) General Anaesthetics
- b) Alcohols and disulfiram
- c) Sedatives, hypnotics, Anti-anxiety agents and centrally acting muscle relaxants
- d) Psychopharmacological agents: Antipsychotics, antidepressants, antimanics
- e) Anti-epileptic drugs & anti parkinsonism
- f) Analgesics, Antipyretics, Anti-inflammatory and Anti-gout drugs
- g) Narcotic analgesics and antagonists
- h) C.N.S. stimulants
- i) Drug Addiction and Drug Abuse

Total 60 hours

Course Outcomes

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

- CO1:** Explain in detail about the general pharmacology.
- CO2:** Outline the Neurohumoral transmission of the central nervous system and peripheral nervous system
- CO3:** Classify the receptors in to types and explain about the stimulants.
- CO4:** Distinguish the difference between the neuromuscular blocking agents.
- CO5:** Identify the central nervous system drugs for a experimental animals

Text books:

1. Essentials of medical pharmacology by Tripathi, K. D, 7th Edition, Publisher: Jaypee brothers medical publishers 2013.
2. Pharmacology and Pharmacotherapeutics by Satoskar, R.S. and Bhadarkar, S.D: 23rd edition Popular prakashan 2013.
3. Pharmacology, Rang, H.P. & Dale M.M. 8th edition. Published by Elsevier, 2015.

Reference books:

1. The Pharmacological basis of therapeutics. Goodman and Gillman. 12th edition. Published by McGraw-Hill Education, 2011
2. Modern Pharmacology by Charles R Craig, & Robert E. Stitzel, 6th edition. Philadelphia ; London : Lippincott Williams & Wilkins, c2004.
3. Basic and clinical pharmacology by Katzung, B.G. 12th edition. Publisher: McGraw-Hill
4. Essentials of Pharmacotherapeutics by F.S.K. Barar, 4th edition, S Chand & Co Ltd 2009.

15CBPH54

Pharmacognosy-IV

Course objective

The objective gives basic knowledge about crude drugs containing different types of alkaloids and its medicinal values. The subject gives information about enzymes from its natural source and its biological role in alternative system of medicine. It also covers the concept and principle about chromatographic techniques for separation, detection, identification of bioactive compounds in herbs and its formulations.

Theory

3-0-0-3

UNIT I

16 hours

Drugs containing Alkaloids

Systematic study of source, cultivation, collection, processing, commercial varieties, chemical constituents, substitutes, adulterants, uses, diagnostic macroscopic and microscopic features and specific chemical tests of following alkaloid containing drugs:

- (a) Pyridine - 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: veratum and Kurchi
- (g) Alkaloidal amine; ephedra and colchicum
- (h) Glycoalkaloid: solanum
- (i) Purines; Coffee, Tea and Cola

UNIT II

12 hours

Plant products in therapeutics

- (a) Artemesin and derivatives
- (b) Taxol and derivatives
- (c) Etoposide and derivatives
- (d) Forscolin
- (e) Gossipol
- (f) Plant bitters and sweeteners - silybum species, phyllanthus species.

UNIT III

10 hours

Enzymes

Biological sources, preparation, identification tests and uses of the following enzymes: Diastase, papain, pepsin, trypsin, pancreatin.

UNIT IV

12 hours

Basic metabolic pathway and biogenesis

General techniques of biosynthetic studies and basic metabolic pathways. Brief introduction to biogenesis of secondary metabolites of pharmaceutical important Flavonoids, glycosides, and alkaloids.

UNIT V

10 hours

Chromatography

Introduction, classification and study of different chromatographic methods and their applications in evaluation of herbal drugs

Total : 60 hours

Course Outcomes

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

- CO1:** Develop knowledge on source, cultivation and collection, chemical constituents, diagnostic macroscopic, microscopic features, adulterants, substitutes, specific chemical test and uses of alkaloid containing crude drugs.
- CO2:** Understand the source, chemistry, isolation, therapeutic uses, commercial products, mechanism of action of plant products and pharmacognostical study of plant bitters and plant sweeteners.
- CO3:** Explain the biological sources, preparation, identification tests and uses of the following enzymes: Diastase, Papain, Pepsin, Trypsin, Pancreatin.
- CO4:** Understand general techniques of biosynthetic studies and basic metabolic pathways and biogenesis of secondary metabolites of pharmaceutical important such as flavonoids, glycosides, and alkaloids.
- CO5:** Analyze herbal drugs using different chromatographic techniques such as TLC, PC, HPLC, HPTLC, GC etc.

Practical

0-0-3-2

1. Macroscopy of crude drugs containing tropane alkaloids.
2. Macroscopy of crude drugs containing quinoline alkaloids.
3. Macroscopy of crude drugs containing indole alkaloids.
4. Macroscopy of crude drugs containing purine bases.
5. Macroscopy of crude drugs containing steroidal and alkaloidal amine.
6. Microscopy of alkaloidal drugs.
7. Powder Microscopy of alkaloidal drugs.
8. Identification test for plant enzyme –papain.
9. Identification test for alkaloids and flavonoid.
10. Thin layer chromatography of chinchona alkaloids.
11. Thin layer chromatography of tropane alkaloids.
12. Thin layer chromatography of purine alkaloids.

Total : 45 hours

CO5: Analyze and interpret Thin Layer Chromatography

Course Outcomes

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

- CO1:** Identify the morphological characters of crude drugs containing tropane, quinoline, purine steroidal and alkaloidal amine.
- CO2:** Evaluate the crude drugs containing alkaloids by section
- CO3:** Analyze the crude drugs containing alkaloids by
- CO4:** Test the presence of alkaloids, flavonoids and terpenoids by identifying chemical test.

Text Books

1. Trease and Evans Pharmacognosy. Fifteenth Edition, William Charles Evans, W. B. Saunders, Edinburg London New York Philadelphia St. Louis Sydney Toronto 2002.
2. Textbook of Pharmacognosy: T. E. Wallis, CBS Publishers and Distributors, New Delhi, 5th Edition, reprinted, 2003
3. A Text book of Pharmacognosy: C. S. Shah, J. S. Quadry. B. S. Shah Prakashan, 13th Edition, 2008.
4. Text book of Pharmacognosy and Phytochemistry, Edwin Jerald E, Sheeja Edwin Jerald. 2007
5. Practical Pharmacognosy, C.K. Kokate M.K.Jainfor Vallabh prakashan 4th edition 1994.
6. Pharmacognosy .C.Kokate,Nirali prakashan .43 rd edition. 2009

drug design process Describe the drug design process from idea to market. Explain the importance of pharmacokinetics, pharmacodynamics and metabolism in relation to the development of new drugs. Explain the development of a given drug. Describe qualitatively the structure - activity relations and discuss their significance to a specific drug development project.

Theory

Reference Books

1. Pharmacognosy: V. E. Tyler, L. R. Brady, J. E. Habbers, ea and Febiger Philadelphia, 9th Edition, 1988.
2. Pharmacognosy and Pharmaco biotechnology – James Robbers, Marilyn K. Speedice and Varro E., Tyler. Wolters klumer (India) Pvt Ltd 9th edition 1988
3. Quality control herbal drugs –Pulok K. Mukherjee, Business horizons 1st edition 2002
4. Textbook of Industrial Pharmacognosy by A.N. Kalia, CBS Publishers 1 st edition 2005
5. Chromatography, Sharma. Goel 5 th edition .1984

15CBPH55 Pharmaceutical Chemistry–V (Medicinal Chemistry-I)

Course

Objective:

The course is designed to impart the knowledge in the field of medicinal chemistry. In medicinal chemistry, the insight into the

Unit I: 1. Basic principles of Medicinal Chemistry:**12 hrs**

(a) Physico-chemical properties and biological activity, receptors and drug-receptor interactions including transduction mechanisms. Ionization, Drug distribution and pKa values, hydrogen bonding, protein binding, chelation, isosterism, optical and geometrical isomerism, steric effect, redox potential and surface activity. Types of receptors, drug-receptor interaction including signal transduction mechanism.

(b) Drug metabolism and pro drug concept: Basic concepts and application of prodrug design

Unit II: Principles of drug design**12 hrs**

Traditional analog (QSAR) and mechanism based approaches (Introduction to graph theory, applications of quantum mechanics, Computer aided drug designing (CADD) and molecular modeling.

Biochemical approaches in drug designing wherever applicable should be discussed. Synthetic procedures of selected drugs, mode of action, uses & structure activity relationship including physicochemical properties of For the UNITS III, IV, V.

Unit III: Central Nervous System**12 hrs**

Drugs acting on the Central Nervous System: i) General Anesthetics, ii) Hypnotics and Sedatives, iii) Anti Convulsants iv) Antiparkinsonism drugs, v) CNS stimulants, vi) Psychopharmacological agents (neuroleptics, Antidepressants, anxiolytics).

Unit IV: Autonomic Nervous System**12 hrs**

Drugs acting on the Autonomic Nervous System: Drugs acting at synaptic and neuro-effector junction sites: (i) Cholinergics and Anticholinergics (ii) Adrenergic and adrenolytics (iii) Neuromuscular blocking agents (iv) Ganglionic blocking agents.

Unit V: Miscellaneous Class of Drugs**12 hrs**

i) Local Anaesthetics, ii) Opioid analgesics, iii) Analgesic-antipyretics, Anti-inflammatory (non steroidal) agents. iv) Antitussives

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

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

- CO1:** Define physicochemical properties and its biological activity of drugs, classify drug receptors, and explain the drug receptor interaction including transduction mechanisms. Illustrate the different drug metabolism pathways and explain prodrugs with its concepts.
- CO2:** Explain the concepts of QSAR and illustrate the various parameters involved in the designing of drugs. Explain about Computer aided drug designing and molecular modeling
- CO3:** Classify the medicinal compounds and outline the synthetic route for important medicinal compounds acting on CNS along with the mechanism of action and Explain the neurotransmitters and receptors involved in CNS
- CO4:** Discuss the concept of drugs acting on autonomic nervous system, explain the receptors involved in it Outline the synthesis of some of important medicinal compounds and structure activity relationship of respective classes
- CO5:** Define and classify local anesthetics discuss narcotic and non narcotic drugs compare and contrast them explain its SAR

Practicals

0-0-3-2

1. Synthesis of benzocaine
2. Synthesis of aspirin
3. Synthesis of butamen
4. Synthesis of sodium salicylate
5. Synthesis of paracetamol
6. Synthesis of chlorbutol
7. Monograph analysis of Benzocaine I.P
8. Monograph analysis of Aspirin I.P
9. Assay of Aspirin
10. Assay of Chlorbutol
11. Partition Coefficient of salicylic acid
12. Partition coefficient of benzoic acid

Course Outcomes

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

- CO1:** Plan the synthetic procedures of some important medicinal compounds
- CO2:** Explain the principle, procedure to estimate the actual amount of drug present in given powder/ Formulation
- CO3:** Interpret the impurity profile of official listed drugs by performing Monograph Analysis
- CO4:** Define partition coefficient and illustrate the determination of partition coefficient using different solvent system
- CO5:** Plan the synthetic procedures of some important medicinal compounds

Textbooks

1. Organic Pharmaceutical and Medicinal Chemistry, J S Qadry, Vol 1 and 2, 4th Edn, CBS, 2012
2. Medicinal Chemistry, Vol 1 and 2, K. Ilango and Valentina, Keerthi, 2007

Reference Books

1. Organic Chemistry of Drug Synthesis, vol. I - vi., Lednicer, Daniel, John Wiley, 2005
2. Textbook of organic, medicinal & pharmaceutical chemistry, Wilson & Gisvolds, Lippincott
3. Advanced practical medicinal chemistry, Ashutosh Kar, New Age, 2009.
4. Burger's medicinal chemistry & drug discovery: Vol 1-5, Brahm Donald J, Wiley, 2003
5. Foye's Principles of Medicinal Chemistry, Thomas Lemke L, 7th edn, Lippincott, 2013
6. Medicinal Chemistry, Ashutosh Kar, 5th edn, New Age, 2010

