

BIOCHEMISTRY

BCH T11B

2020-2021

B.Sc. (FMB)

SEMESTER - I

PAPER –I

No. of Credits-4

BIOMOLECULES

4Hrs/Week

Marks:75

Unit - I: Biophysical Concepts

12 hours

Water as a biological solvent, Buffers, measurement of pH, Electrodes, Biological relevance of pH, pKa value, analysis of drinking water and pond water Introduction to Different types of waters such as Potable water, Purified Water, Distilled Water, Deionized Water, RO Water, Water for Injection, Different Types of Waters used in the pharmaceutical industry, water for Vaccines. Total dissolved salts (TDS), BOD, COD, soil analysis (texture, organic matter, elements), Electrical conductivity

Unit-II: Carbohydrates

12 hours

Carbohydrates: Classification, monosaccharides, D and L designation, open-chain and cyclic structures, epimers and anomers, mutarotation, reactions of carbohydrates (due to functional groups - hydroxyl, aldehyde, and ketone. Amino sugars, Glycosides. Structure and biological importance of disaccharides (sucrose, lactose, maltose), structural polysaccharides (cellulose, chitin, pectin) and storage polysaccharides (starch, inulin, glycogen). Glycosaminoglycans, Bacterial cell wall polysaccharides, and Blood group substances. Galactomannans and their applications in modern foods.

Unit – III: Lipids

12 hours

Lipids: Classification, saturated and unsaturated fatty acids, structure and properties of fats and oils (acid, saponification and iodine values, rancidity). General properties and structures of phospholipids. Prostaglandins- structure, types, and biological role. Lipoproteins- types and functions, Biomembranes Membrane composition and organization - Fluid mosaic model. Formation of micelles, bilayers, vesicles, liposomes.

Unit-IV: Amino Acids and Proteins

12 hours

Amino Acids: Classification, structure, stereochemistry, chemical reactions of amino acids due to carbonyl and amino groups. Titration curve of glycine and pk values. Essential and nonessential amino acids, nonprotein amino acids. Peptide bond - nature and conformation. Naturally occurring peptides - glutathione, enkephalin. Proteins: Classification based on solubility, shape, and function. Determination of amino acid composition of proteins. General properties of proteins, denaturation and renaturation of proteins. Structural organization of proteins- primary, secondary, tertiary, and quaternary structures (Eg. Hemoglobin and Myoglobin). Ramachandran plot.

Unit-V: Nucleic acids and porphyrins

12 hours

Types of RNA and DNA. Structure of purines and pyrimidines, nucleosides, nucleotides. Stability and formation of phosphodiester linkages. Effect of acids, alkali, and nucleases on DNA and RNA. Structure of Nucleic acids- Watson-Crick DNA double helix structure, denaturation and renaturation kinetics of nucleic acids-, Tm-values and their significance, cot curves and their significance. Structure of porphyrins: Identification of Porphyrins, Protoporphyrin, porphobilinogen properties, Structure of metalloporphyrin's-Heme, cytochromes and chlorophylls.

Text Books:

1. 1. Biochemistry – Prof. U. Satyanarayana
2. 2. Biochemistry - Donald Voet & Judith Voet
3. 3. Biochemistry - Lubert stryer John L. Tymoczko
4. Soil Testing Manual by Dr. G. S. Wagh.
5. Soil Testing and Plant Analysis: Part I Soil Testing, Volume
6. SSSA Special publications by Glenn W. Hardy.

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7. Soil Analysis: An interpretation manual by K. I. Peverill, L. A. Sparrow, D. J. Reuter
8. The biochemistry of Nucleic acids; Adams et al., Chapman and Hall, 1986.
9. Proteins: A guide to study by physical & chemical methods, Haschemeyer and Haschemeyer
10. Proteins: Structure, function and evolution. Dickerson & Geis, 2nd Edn, Benjamin/Cummings.
11. Biochemistry - Zubay C, Addison – Wesley, 1986.
12. Biochemistry, A problem Approach, 2nd Edn. Wood, W.B. Addison Wesley 1981.
13. Biochemistry, Lehninger A.H.
14. Textbook of Biochemistry West, E.S., Todd, Mason & Vanbruggen, Macmillian&Co.
15. Principles of Biochemistry White-A, Handler, Pand Smith E.L. Mc Grew Hill. Organic chemistry, I.L. Finar, ELBS. (1985).
16. Organic Chemistry by Morrison and Boyd (2000) Prentice Hall.
17. Fundamentals of Biochemistry by Donald Voet (1999).
18. Indian Pharmacopeia available in the pharmacy department

Reference Books:

1. Principles of Biochemistry – Lehinger, David L. Nelson Albert L. Lehinger
2. Harper, Rama Rao.T, Frifelder .
3. Biochemistry – Christopher K. Methews

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BIOCHEMISTRY

BCH P11B

2020-2021

B.Sc. (FMB)

SEMESTER-I

No. of Credits-1

PRACTICAL – I

Marks:50 2Hrs/Week

Qualitative analysis (NEW SYLLABUS)

1. Preparation of buffers (acidic, neutral and alkaline) and determination of pH.
2. Qualitative identification of carbohydrates- glucose, fructose, ribose/xylose, maltose, sucrose, lactose, starch/glycogen.
3. Qualitative identification of amino acids-histidine, tyrosine, tryptophan, cysteine, arginine.
4. Qualitative identification of lipids- solubility, saponification, acrolein test, Salkowski test, Lieberman-Burchard test
5. Preparation of Osazones and their identification.

Text Book: 1. Practical Biochemistry – Wilson & Walker

- Reference Books:**
1. Practical Biochemistry – David Plummer
 2. Practical Biochemistry – J. Jayaraman
 3. Instrumental methods of Chemical Analysis – Chatwal & Anand

BIOCHEMISTRY

BCHT21B

2020-2021

B.Sc. (FMB)

SEMESTER - II

PAPER – III

No. of Credits – 4

60Hrs- 4Hrs/Week

BIOANALYTICAL TECHNIQUES

Unit-I: Cell homogenization and centrifugation

12 hour

Introduction to types of Cells & Cell Lysis, methods of tissue homogenization: (Potter-Elvehjem, mechanical blender, sonicator and enzymatic). Centrifugation techniques, principles and applications- differential, density gradient. Ultra-centrifugation- preparative and analytical.

Unit-II: Chromatographic techniques

12 hour

Types of chromatographic techniques, Principle and applications - Paper chromatography- solvents, R_f value, applications; Thin layer chromatography- principle, choice of adsorbent and solvent, R_f value, applications; Gel filtration, Ion- exchange- principle, resins, the action of resins, experimental techniques, applications, separation of metal ions; Affinity chromatography. Introduction to HPLC

Unit-III: Electrophoresis

12 hours

Electrophoresis- principles and applications of paper, polyacrylamide (native and SDS) and agarose gel electrophoresis, isoelectric focusing, immune-electrophoresis-types and applications.

Unit-IV: Spectroscopy

12 hours

Electromagnetic radiation, Beer-Lambert's law. Introduction to Absorption & Emission spectroscopy, Molar Extinction coefficient, Colorimetry and Spectrophotometry, spectrofluorimetry, flame photometry.

Unit-V: Tracer Techniques

12 hours

Tracer techniques: Radioisotopes, Radioactivity, units of radioactivity, half-life, β , and γ - emitters
Diagnostic uses of radioactive isotopes:

Invivo Studies: Dilution studies, Dynamic function tests, Organ scanning, Autoradiography

Invitro Studies : RIA, ELISA, T3 resin/ sponge uptake studies.

Learning Resources:

Text Books :

1. Text book of Biophysical Chemistry — Nath & Upadhyaya.
2. Biochemistry — Prof. U. Satyanarayana.
3. Principles and Techniques of practical Biochemistry. Eds. Williams and Wilson.
4. Techniques in Molecular biology Ed. Walker & Gastra, Croom Helm, 1983.
5. Principles of instrumental analysis, 2nd Ed, Holt-Sanders, 1980.
6. An introduction to spectroscopy for Biochemistry. Ed. Brown S.N., Academic press
7. Analytical Biochemistry, Holmes and Hazel peck, Longman, 1983.
8. An introduction to practical biochemistry. David T. Plummer, Tata Mac Grew-Hill.
9. Biophysical chemistry, Edshall & Wyman, Academic press Vol. II & I.
10. A textbook of quantitative inorganic analysis including elementary instrumental analysis, Vogel ELBS.
11. Biochemical calculations Seigel, IH, 2nd Edit, John Wiley & sons Inc., 1983.
12. Analytical Biochemistry by Friefelder David

Reference Books:

1. Biochemistry - Donald Voet & Judith Voet
2. Biochemistry - Lubert stryer John L. Tymoczko
3. Principles of Biochemistry – Lehinger, David L. Nelson Albert L. Lehinger

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4. Harper, Rama Rao.T, Frifelder .

5. Biochemistry – Christopher K. Methews

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SEMESTER - II

PRACTICAL – II

Marks:50

No. of Credits – 1

BIO ANALYTICAL TECHNIQUES LAB

2Hrs/Week

1. Qualitative identification of DNA, RNA and Nitrogen bases
2. Reactions of proteins - Colour and precipitation reactions of
 - a. Albumin
 - b. Casein
3. Absorption Maxima of Coloured Substances - p- Nitrophenol, Methyl Orange.
4. Absorption Spectra of Protein- BSA, Nucleic Acids
5. Isolation of Starch from Potatoes
6. Isolation of Casein from Milk
7. Separation of Amino Acids by Paper chromatography
8. Separation of Serum proteins by paper electrophoresis
9. Separation of Plant pigments by TLC
10. Isolation of Cholesterol from Egg Yolk

Text Book: 1. Practical Biochemistry – Wilson & Walker

Reference Books:

1. Practical Biochemistry – David Plummer. 2. Practical Biochemistry – J. Jayaraman.
1. Instrumental methods of Chemical Analysis – Chatwal & Ananad

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SEMESTER - III

PAPER – III
No. of Credits- 4

Unit-I: Enzymology and Bioenergetics 12 hours

Introduction to Biocatalyst, Nomenclature and classification of enzymes, Holoenzyme, apoenzyme, coenzyme, cofactor, active site, enzyme units, Enzyme specificity. Interaction between enzyme and substrate-lock and key, induced fit models.. Michaelis - Menten equation for the uni-substrate reaction (derivation not necessary), Significance of K_m and V_{max} , Enzyme inhibition – competitive and non-competitive, industrial application of enzymes.

Bioenergetics: Principles of Thermodynamics, Energy Transformations in living systems, High energy compounds, Structure of Mitochondria, Organization of complexes and electron carriers of ETC, Mechanism of oxidative phosphorylation, inhibitors of oxidative phosphorylation, Uncouplers of ETC.

Unit-II: Carbohydrate Metabolism. 12 hours

Photosynthesis- Light reactions (Photophosphorylation) and Dark reactions- C₃, C₄ Pathway. Concept of anabolism and catabolism. Glycolytic pathway, regulation and energy yield, fate of pyruvate- Lactate, Citric acid cycle, regulation, energy yield, amphipathic role, Anaplerotic reactions, Pentose phosphate pathway, Gluconeogenesis, Glycogen Metabolism- Glycogenesis and Glycogenolysis, Glycogen storage diseases (in brief)

Unit-III: Lipid Metabolism 12 hours

Catabolism of fatty acids (β - oxidation) with even and an odd number of carbon atoms, Ketone body synthesis, denovo synthesis of fatty acids, Biosynthesis and degradation of triacylglycerol and lecithin. Biosynthesis of cholesterol. Inborn errors of Lipid Metabolism –Niemann- pick, Gaucher's diseases.

Unit-IV: Metabolism of Amino acids 12 hours

General reactions of amino acid metabolism- transamination, deamination and decarboxylation. Urea cycle and its regulation, Biosynthesis of creatine. Metabolism of glycine, serine, methionine and leucine and Phenylalanine, inborn errors of aromatic amino acids- Phenylketonuria, Alkaptonuria,

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Unit-V: Nucleic Acid and Porphyrin Metabolism 12hours

Biosynthesis of Purines and Pyrimidine nucleotides (denovo and salvage pathways), Catabolism of purines and pyrimidines. Biosynthesis of deoxyribonucleotides- ribonucleotide reductase and thymidylate synthase and their significance. Disorders of nucleotide metabolism- Gout, Lesch-nyhan syndrome.

Heme Biosynthesis and Degradation.

Learning Resources:

TEXT BOOKS :

1. Understanding enzymes: Palmer T., Ellis Harwood ltd., 2001.
2. Enzyme structure and mechanism. Alan Fersht, Freeman & Co. 1997
3. Principles of enzymology for food sciences: Whitaker Marc Dekker 1972.
4. Principles of Biochemistry, White. A, Handler, P and Smith.
5. Biochemistry, Lehninger A.L.
6. Biochemistry, Lubert Stryer.
7. Review of physiological chemistry, Harold A. Harper.
8. Text of Biochemistry, West and Todd.
9. Metabolic pathways – Greenberg.
10. Mitochondria, Munn.
11. Biochemistry, 2nd Edition, G. Zubay.

REFERENCE BOOK:

1. Text Book of Medical Biochemistry - Chatterjea & Schinde
2. Text Book of Biochemistry - U.Satyanarayana
3. Fundamentals of Biochemistry - J.L. Jain

BIOCHEMISTRY

BCHP31A

2021-2022

B.Sc (FMB)

SEMESTER - III

Marks:50

PRACTICAL – III

No. of Credits-

42Hrs/Week_

Quantitative Analysis

1. Assay of amylase.
2. Assay of urease.
3. Assay of catalase
4. Effect of pH, temperature and substrate concentration on enzyme activity.
5. Estimation of glucose by DNS method.
6. Estimation of total carbohydrates by Anthrone method.
7. Estimation of amino acid by Ninhydrin method.
8. Estimation of protein by Biuret method

Learning Resources:

TEXT BOOKS:

1. An introduction of practical biochemistry- Pulmer .D. T.Tata Mc Grawhill
2. Introductory practical biochemistry Sawhney- S.k. Ranadhir singh, Narosa publication house
3. Practical clinical biochemistry- Varley. H, CBS publishers
4. Practical Biochemistry J. Jayraman

REFERENCE BOOKS: 1. Physiological Chemistry - Hawk

- 2.Outlines of Biochemistry - Conn & Stumpf

		2021-22	
BIOCHEMISTRY	BCHT42		B.Sc (FMB)

SEMESTER - IV

No. of Hours : 60

PAPER – IV

No. of Credits-4

Physiology, Endocrinology and Clinical Biochemistry

Unit-I: Digestion and Blood

12 hours

Digestion and absorption of carbohydrates, lipids and proteins. Role of enzymes and gastro intestinal hormones in digestion. Composition of blood, Blood groups, coagulation of blood and disorders of blood coagulation (haemophilia). Haemoglobin and transport of gases in blood (oxygen and CO₂) Types of anaemia, haemoglobinopathies-sickle cell anaemia.

Unit-II: Nervous and Excretory system

12 hours

Introduction to nervous system, general organization of nervous system, Neurons- structure, types, properties and functions; Neurotransmitters, Cerebrospinal fluid- composition and functions, Reflex-types and properties.

Introduction to excretory system , Organization of kidney, Structure and functions of nephron, Urine formation, Role of kidneys in maintaining acid-base and electrolyte balance in the body.

Unit III: Endocrinology-1

12 hours

Endocrinology-organization of endocrine system, Types of glands, Classification of hormones based on groups. Outlines of chemistry physiological role and disorders of hormones of thyroid, parathyroid, pituitary and hypothalamus.

Unit IV: Endocrinology -2

12hours

Introduction of gastrointestinal hormones, Pancreatic hormones- insulin, Adrenal gland hormones – Catecholamines, Gonadal hormones- Testosterone, estrogen and progesterone. Mechanism of hormonal action-signal transduction pathways for glucocorticoids

Unit-V: Clinical Biochemistry

12hours

Plasma proteins in health and disease. Liver diseases-jaundice. Liver function tests- conjugated and total bilirubin in serum, albumin: globulin ratio, Serum enzymes in liver diseases-SGOT, SGPT, GGT,CPK, Acid and alkaline phosphatases. Serum lipids and lipoproteins. GTT and gastric and pancreatic function test. Normal and abnormal constituents of urine . Renal function tests-Blood urea, creatinine, GFR, creatinine clearance.

Text Books:

1. Text Book of Biochemistry with clinical correlations. Thomas M. Devlin (John Wily).
3. Harper's Review of Biochemistry, Murray et al (Longman).
4. Biochemical aspects of human disease – R.S. Elkeles and A.S. Tavit. (Blackwell Scientific Publications).

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5. Clinical chemistry in diagnosis and treatment—Joan F.Zilva and P.R.Pannall (Lloyd- Luke Medical Books, 1988)

Reference Books:

1. Varley's Practical clinical Biochemistry – Ed. Alan W. Gowenlock (Heinemann Medical Books, London, 1988).
3. Clinical diagnosis and management by Lab methods (John Bernard Henry, W.B. Salunders Company, 1984).
5. Clinical Biochemistry – S.Ramakrishnan and Rajiswami.
6. Chemical Biochemistry (Metabolic and clinical aspects) by W.J.Marshall & S.K.Bangert.
7. Text book of clinical Biochemistry by Tietz et al.

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Practical : Physiology and Clinical Biochemistry

45 HRS

1. Estimation of hemoglobin in blood.
2. Total count - RBC and WBC. Differential count
3. Determination of blood group and Rh typing
4. Urine analysis for albumin, Sugars and Ketone bodies
5. Estimation of urinary creatinine
6. Estimation of blood Glucose
7. Estimation of serum total cholesterol
8. Estimation of calcium by titrimetry
9. Estimation of vitamin C by 2,6 dichlorophenol indophenol method

REFERENCE BOOKS:

1. Practical Biochemistry By : David Plummer.
2. Practical Biochemistry By : J. Jayaraman..
3. Practical clinical Biochemistry By : Harold varley
4. Physiology Chemistry By : Hawk.

BIOCHEMISTRY	BCHT43	2021-22	B.Sc. (FMB)
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SEMESTER - IV
No. of Hours : 60

PAPER – V
No. of Credits-4

Immunology, Genetics and Applied Biochemistry

Unit-I: Nitrogen Fixation

9 hours

Nitrogen cycle, Non-biological and biological nitrogen fixation , photosynthetic and non- photosynthetic systems, Nitrogenase system. Utilization of nitrate ion, Ammonia incorporation into organic compounds Synthesis of glutamine and regulatory mechanism of glutamine synthase.

Unit-II: Applied Biochemistry

14 hours

Fermentation Technology: Batch, continuous culture techniques, principle types of fermenters. Pasteur Effect. Industrial production of chemicals- alcohol, acids (citric acid), solvents (acetone), antibiotics (penicillin), Enzyme Technology: Immobilization of enzymes and cells, industrial applications, enzymes in Bioremediation

Unit- III: Immunology

14 hours

Organs and cells of immune system. Innate and acquired immunity, Cell mediated and humoral immunity (T-cells and B-cells). Classification of immunoglobulins, structure of IgG. Epitopes / antigenic determinants. Concept of haptens. Adjuvants. Monoclonal antibodies. Antigen-antibody reactions- agglutination, immunoprecipitation, immunodiffusion. Blood group antigens. Immunodiagnostics- ELISA. Vaccines and their classification. Traditional vaccines-live and attenuated. Modern vaccines- recombinant and peptide vaccines. Outlines of hypersensitivity reactions.

Unit-IV:Genetics

9 hours

Structure of gene, gene and environment, gene copies of prokaryotic and eukaryotic chromosomes, eukaryotic chromosome organization, histone proteins. Gene transfer in bacteria (Conjugation, transformation and transduction).

Unit-V: rDNA technology:

14 hours

Outlines of cloning technology, vectors, Host, restriction enzymes, Application of rDNA Technology- Insulin and Growth hormone, Applications cloning in agriculture, industry and medical fields
Blotting Techniques- Southern blot, Northern Blot, Western blot and Dot blot
PCR- Principle, Technique and applications of PCR

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Text Books:

1. Willey MJ, Sherwood, LM & Woolverton C J (2013) Prescott, Harley and Klein's Microbiology by. 9th Ed., McGrawHill.
2. Atlas RM. (1997). Principles of Microbiology. 2nd edition Publishers.
3. Pelczar MJ, Chan ECS and Krieg NR. (1993). Microbiology. 5th edition. McGraw Hill Book Company. Fermentation Technology (2nd ed.) Standury (Pergman press)
5. Biotechnology: Textbook of Industrial microbiology 2nd Edit. By Crueger and Crueger (2000).

Reference Books:

1. Principles of Biochemistry, White. A, Handler, P and Smith.
2. Goldsby RA, Kindt TJ, Osborne BA. (2007). Kuby's Immunology. 6th edition
3. W.H. Freeman and Company, New York.
4. Richard C and Geiffrey S. (2009). Immunology. 6th edition. Wiley Blackwell Publication.
5. Watson JD, Baker TA, Bell SP, Gann A, Levine M and Losick R (2008) Molecular
6. Biology of the Gene, 6th edition, Cold Spring Harbour Lab. Press, Pearson
7. Publication.
8. Molecular biology by David Freifelder

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Practical : Immunology and Clinical Biochemistry **45 HRS**

1. Demonstration of alcohol fermentation.
2. Antibiotic sensitivity by paper disc method.
3. Effect of nitrogen sources on growth of E. coli- demo
4. Immuno diffusion by Ouchterlony method.
5. Isolation of DNA from Plant tissue/ coconut endosperm
6. Spotters- chromosomes, DNA double helical structure

REFERENCE BOOKS:

1. Practical Biochemistry By : David Plummer.
2. Practical Biochemistry By : J. Jayaraman..
3. Practical clinical Biochemistry By : Harold varley
4. Physiology Chemistry By : Hawk.

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BIOCHEMISTRY	BCHT51	2017-18	B.Sc. (FMB)
		2018-19	

Elective: HUMAN PHYSIOLOGY AND ENDOCRINOLOGY

Semester : V

No of Credits:3

No. of Hours : 45

Unit- I : Physiology

9 Hrs

Digestion and absorption of carbohydrates, lipids and proteins. Composition of blood and coagulation of blood. Hemoglobin and transport of gases in blood (oxygen and CO₂).

Muscle- kinds of muscles, structure of myofibril, organization of contractile proteins and mechanism of muscle contraction.

UNIT-II

9 Hrs

Nervous system- structure of neuron, resting potential, action potential, propagation of nerve impulse, synapse, synaptic transmission, excitatory and inhibitory neurotransmitters.

UNIT:III:Endocrinology

9 Hrs

Endocrinology- Endocrine system, organization of endocrine system. Types of Glands, Classification of hormones, based on groups, Outlines of chemistry, physiological role and disorders of hormones of Pituitary Gland - anterior pituitary hormones, posterior pituitary hormones and hypothalamus.

UNIT: IV

9 Hrs

Thyroid Gland - T₃, T₄, THS, Parathyroid Gland - PTH, Calcitonin. Pancreas - insulin, Glucagon, somatostatin. Gastro Intestinal Hormones – Gastrin, Secretin, Cholecystokinin, Gastric inhibitory peptide.

UNIT:V

9 Hrs

Pineal Gland: Pineal Hormones, Adrenal Hormones- Hormones of Adrenal Cortex and Medulla Gonadal Hormones – Estrogen, Progesteron, Testosteron, placental Hormones - Placental lactogen, Chorionic gonadotrophin.

Text Books:

1. Textbook of Biochemistry and Human Biology – Talwar, G.P. and Srivastava. L.M., Printice Hall of India
2. Textbook of Medical Physiology – Guyton.A.G and Hall.J.E., Saunders

Reference Books:

1. Review of Medical Physiology-Ganong. McGraw-Hill.
2. Human Physiology – Chatterjee.C.C, Medical Allied Agency
3. William's Textbook of Endocrinology – Larsen, R. P. Korenberg, H. N. Melmed, S. and Polensky, K. S. Saunders
4. Mammalian Biochemistry- White, A. Handler, P. and Smith, E. L. McGraw-Hill.

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BIOCHEMISTRY	BCHP51	2017-18	B.Sc. (FMB)
		2018-19	

No of Credits:1

Theory Practical:: HUMAN PHYSIOLOGY AND ENDOCRINOLOGY --

45Hrs

1. Estimation of Haemoglobin
2. Identification of Blood Groups
3. Identification of Rh factor of Blood
4. Blood smear
5. Blood clotting time.
6. Total count
7. Differential count.
8. Muscle tissue : Striated and cardiac muscle and smooth muscle
9. Nervous tissue
10. Estimation of T3, T4, TSH by using Auto analyser Demonstration

Reference Books:

1. Practical Clinical Biochemistry Warley, H. CBS Publishers.
2. Practical Clinical Biochemistry –Methods and Interpretations –Ranjana Chawla- Jaypee

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BIOCHEMISTRY	BCHT52	2017-18	B.Sc. (FMB)
		2018-19	

Semester-V

Cluster: **BIOTECHNOLOGY**

No of Credits:3

Unit-I: Regulation of Gene Expression

9 Hrs

Regulation of Gene Expression- Operon Concept- positive and negative control. Lactose operon, Tryptophan operon, arabinose operon, galactose operon

UnitII: Methods of Gene sequencing

9 Hrs

Methods of gene sequencing – Maxam - Gilberts and Sanger's Dideoxy chain termination methods; Polymerase chain reaction- principle technique of PCR, sources of DNA polymerase, Variations of PCR- Nested, inverse, anchored, reverse transcription, Asymmetric, real time PCR and applications.

UNIT:III

9 Hrs

Blotting techniques- Southern Blotting Technique, Northern Blotting Technique and Western Blotting Technique, Dot Blot.

.Tools of r-DNA technology enzymes Restriction endonuclease ,ligase, phosphatase.

Unit:IV: r DNA Technology

9 Hrs

Tools of r-DNA technology: Enzymes, reverse transcriptase, polynucleotide kinases, terminal transferase, nucleases-S1 and RNAase H. Restriction mapping.

Cloning vectors- Plasmid, Expression vector - Host- *E.coli*.

Applications of gene cloning- production of insulin and human growth hormone.

Unit:V: Bioinformatics

9 Hrs

Introduction to Bioinformatics- definitions of proteomics and genomics. Gene bank, NCBI, DDBJ, Swissprot, PDB. Sequence alignments- BLAST and FASTA

Text Books:

1. Protein Biochemistry & Biotechnology- Walsh. John Wiley & Sons Press.
2. Molecular Biology of Cell- Alberts, B. Bray, D. Lewis, J. Raff, M. Roberts, K. and Watson, J. D. Garland Publishing.

Reference Books:

1. Recombinant DNA and Biotechnology: A Guide for teachers- Helen and Massey. ASM Press. Molecular Biology- Freifelder. D. Naroasa Pub. House
2. Molecular Biology of the Gene- Watson. J.D., Baker, T.A, Bell, S.P., Gann.A, Levine,M. and Losick.R, Pearson Education.
3. Molecular Biotechnology- Glick, B. R. and Pasternak, J. J. ASM Press/ Dubey, R. C. S. Chand & Co.

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BIOCHEMISTRY	BCHP52	2017-18	B.Sc. (FMB)
		2018-19	

Elective Practical :

BIOTECHNOLOGY

No of Credits:1
45Hrs

1. . Determination of absorption maxima of DNA and RNA and their quantification
2. Quantitative estimation of RNA by orcinol method
3. Quantitative estimation of DNA by Diphenylamine method
4. . Demonstration of PCR
5. Separation of DNA by Agarose gel Electrophoresis
6. Isolation of DNA from onion/liver/coconut endosperm.

Reference Books:

1. Biotechnology: A laboratory Project in Molecular Biology- Thiel, Bissen and Lyons. Tata McGraw-Hill.
2. . Methods in Biotechnology- Hans-Peter Schmauder. Taylor & Francis.

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BIOCHEMISTRY	BCHTELS52	2017-18	B.Sc. (FMB)
		2018-19	

Semester: V

Elective:II **MOLECULAR BIOLOGY**

No of Credits:3

45 Hours

Unit I:

9 Hrs

Genome Structure: Watson and Crick model of DNA; Concepts of Genetic Material, Chromosome and Genome. Experiments to prove DNA as genetic material (Griffith experiment, Hershey-Chase experiment)

Unit II:

9 Hrs

DNA Replication, Enzymology of replication (DNA polymerase I, pol II and III, helicases, topoisomerases, single strand binding proteins, DNA melting proteins, primase. Proof of semiconservative replication, Replication origins, initiation, elongation, and termination.

Unit III:

9 Hrs

Transcription :Enzymatic synthesis of RNA: Basic features of transcription, structure of prokaryotic RNA polymerase (core enzyme and holo enzyme, sigma factor), concept of promoter (Pribnow box, -10 and -35 sequences)

Unit: IV:

9 Hrs

Four steps of transcription (promoter binding and activation, RNA chain initiation, chain elongation, termination and release). Reverse transcription

Unit:V:

9 Hrs

Structure of m RNA, brief structure of tRNA, the adaptor hypothesis, attachment of amino acids to tRNA. Codon-anticodon interaction - the wobble hypothesis. Initiation, elongation, termination of protein. . Genetic Code and Protein Synthesis

Reference Books:

1. Molecular Biology of Cell- Alberts, B. Bray, D. Lewis, J. Raff, M. Roberts, K. and Watson, J. D. Garland Publishing.
2. Molecular Biology- Freifelder. D. Naroasa Pub. House
3. Molecular Biology of the Gene- Watson. J.D., Baker, T.A, Bell, S.P., Gann.A, Levine,M. and Losick.R, Pearson Education.
4. Molecular Biotechnology- Glick, B. R. and Pasternak, J. J. ASM Press
5. Principles of Gene Manipulation: An Introduction to GE- Old, R. V. and Primrose

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BIOCHEMISTRY	BCHPELS52	2017-18	B.Sc. (FMB)
		2018-19	

Elective Practical:

MOLECULAR BIOLOGY

No of Credits:1

45Hrs

1. Effect of UV radiations on the growth of microorganisms.
- 2 . Isolation of plasmid DNA from bacteria
3. Isolation of genomic DNA from E. coli
4. Isolation of DNA from sheep liver
5. Isolation of DNA from plant leaves (Rice or Tobacco or any other plant)
6. Purity analysis of the Nucleic acids

Reference Books:

1. Biochemical Methods –Sadasivam, S and Manickyam, A.- New Age International publishers
2. An Introduction to Practical Biochemistry- Plummer, D. T. Tata McGraw-Hill.
3. Introductory Practical Biochemistry (ed) Sawhney, S. K. Randhir Singh- Narosa Publications House
4. Lab Manual in Biochemistry, Immunology and Biotechnology- Arti Nigam and Archana Ayyagari- Tata McGraw-Hill New Delhi
5. Enzyme Assays – A Practical Approach – Eisenthal, R and Dawson, M.J., IRL Press
6. Practical Biochemistry – Rameshwar. A, Kalyani Publisher.
7. Experiments and Techniques in Biochemistry – Sheel Sharma, Galgotia Publications.
8. Practical Clinical Biochemistry-Varley,H. CBS Publishers.
9. Practical Clinical Biochemistry –Methods and Interpretations –Ranjna Chawla- Jaypee

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BIOCHEMISTRY	BCHTCL61	2017-18	B.Sc. (FMB)
		2018-19	

Semester :VI

Interdisciplinary cluster subject
CLINICAL BIOCHEMISTRY

No of Credits:3

UNIT-I

9 Hrs

Structure and functions of the liver. Liver diseases-jaundice, hepatitis, cirrhosis. Liver function tests-conjugated and total bilirubin in serum, albumin: globulin ratio, hippuric acid and bromsulphthalein tests. Serum enzymes in liver diseases – Transaminases, Alkaline phosphatase, γ - Glutamyl transpeptidase.

UNIT-II

9 Hrs

Kidneys- structure of nephron, urine formation, normal and abnormal constituents of urine. Biological buffers. Role of kidneys in maintaining acid-base and electrolyte balance in the body. Renal function tests- creatinine and urea clearance test

UNIT- III

9 Hrs

Disorders of carbohydrate metabolism- Factors affecting blood glucose levels: Types of Diabetes mellitus, hypo and hyper glycemias. Glucose tolerance tests(IV/Oral). glycogen storage diseases, Glycosuria, Fructosuria, Lactosuria, & Mucopolysaccharidosis(Hurler's and Hunter's syndromes).Serum markers for clinical diagnosis of diabetes.

UNIT-IV

9 Hrs

Inborn errors of metabolism. :

- a. Proteins: Phenylketonuria, Alkaptonuria, Albinism, Maplesyrup disease, Hartnups and Cystinuria.
- b. Lipids:Niemannpick,Taysach's, Gaucher's and Krabbe's.
- c. Porphyrins : Intermittent acute porphia, Porphyrria cutanea tarda, protoporpha

UNIT: V

9 Hrs

Estimation of Enzymes: Serum Glutamate pyruvate transaminase(SGPT), Serum Glutamate oxaloacetate transaminase (SGOT), Alkaline Phosphatase (ALP). Estimation of Cholesterol, Protein in serum.

TEXT BOOKS:

1. Text Book of Medical Biochemistry – Chatterjea & Shinde
2. Biochemistry – Prof. U. Satyanarayana

REFERENCE BOOK:

1. Text book of Medical Lab technology- Mukharjee vol-I –II &III
2. Text book of Medical Lab technology- V.H.Talib
3. Text book of Medical Lab technology – Dr. PrafulB.Godk

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		2018-19	

Semester :VI

No of Credits:1

No. of Hours : 45

Cluster Practical: CLINICAL ANALYSIS

1. Isolation of hemin and haemochromogen crystals from blood
2. **Analysis of urine**, p^H determination, qualitative tests for sugars, proteins,
3. Faecal matter analysis
4. Estimation of Blood glucose by GOD-POD method.
5. Estimation of blood Urea.
6. Estimation of blood uric acid.
7. Estimation of serum cholesterol.
8. Estimation of bilirubin.

REFERENCE BOOKS:

1. Practical Biochemistry By : David Plummer.
2. Practical Biochemistry By : J. Jayaraman.
3. Practical clinical Biochemistry By : Harold varley
4. Physiology Chemistry By : Hawk.

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BIOCHEMISTRY	BCHPEL61	2017-18	B.Sc. (FMB)
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Elective Practical:
No of Credits:1

BIOCHEMISTRY OF CELL

45Hrs

1. Microscopy
2. Preparation of permanent slides.
3. Slides of various cell organelles,
4. Mitosis from onion root tip.
5. Meiosis from flower bud.
6. Cell fractionation.
7. Cell counting.
8. Identification of Bar body

Reference Books:

1. Microbiology – A Laboratory Manual- Cappuccino, J. G. and Sherman, N. Pearson Education.
2. Laboratory Experiments in Microbiology- Gopal Reddy, M., Reddy, M.N., Sai Gopal D. V.R. and Mallaiah, K.V.
3. Experiments in Microbiology, Plant Pathology, Tissue Culture and Mushroom cultivation-Aneja, K. R - New Age International publishers.
4. Microbiology – A Laboratory Manual- Reddy, S. M. and Ram Reddy, S. Sri Padmavathi Pub.
5. Practical Microbiology- Dubey, R. C. and Maheshwari, D. K. S. Chand & Co.

BIOCHEMISTRY	BCHTCLS62	2017-18	B.Sc. (FMB)
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Biochemical Correlations in Diseases

Semester :VI

No of Credits:3

Unit- I : Inborn errors of metabolism

9 Hrs

Alkaptonuria, Phenylketonuria, Albinism, Maplesyrup disease, Hartnups and Cystinuria. , Glycogen storage diseases.

Unit: II

9 Hrs

Lipids:Niemannpick,Taysach's, Gaucher's and Krabbe's.Porphyrins : Intermittent acute porphia, Porphyria cutanea tarda, protoporpha.

Unit- III: Nutritional Deficiency and Life style diseases

9 Hrs

Kwashiorkar, Marasmus, Beri-beri, Scurvy, Pellagra, Anaemia, Night blindedness, Rickets, Osteomalacia, Osteoporosis, Wilson's disease. Obesity, Cardiovascular diseases, Atherosclerosis, Diabetes mellitus-II.

Unit- IV: Hormonal Imbalances and Autoimmune diseases

9 Hrs

Outline of hormone action and imbalances leading to disease - precocious puberty, hyper and hypopituitarism. Hyper and hypothyroidism. Concepts in immune recognition - self and non self discrimination, organ specific autoimmune diseases – Hashimoto's thyroiditis, Grave's disease, Systemic diseases - rheumatoid arthritis;

Unit- V : Diseases caused due to misfolded proteins

9 Hrs

Alzheimer's, Huntington's disease, Kuru, Creutzfeldt-Jakob disease, Sickle cell anaemia, Thalessemia.

Text Books:

1. Textbook of Biochemistry with Clinical Correlations (2011) Devlin, T.M. John Wiley & Sons, Inc.(New York), ISBN: 978-0-4710-28173-4.2. Immunology: A Short Course (2009) 6 66 th ed., Coico, R and Sunshine, G., John Wiley& sons, Inc

1. (New Jersey), ISBN: 978-0-470-08158-7

ReferenceBooks:

1. Biochemistry (2012) 7 th ed., Berg, J.M., Tymoczko, J.L. and Stryer, L., W.H Freeman and Company

2. (New York), ISBN: 13:978-1-4292-7635-1.

3. Genetics (2012) 6th ed., Snustad, D.P. and Simmons, M.J., John Wiley & Sons. (Singapore), ISBN: 978-1-118-09242-

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Elective Practical: **Biochemical Correlations in Diseases**

45Hrs

Semester :VI

No of Credits:1

1. Glucose tolerance test.
2. Lipid profile: triglycerides and total cholesterol.
3. Obesity parameters.
4. Estimation of Ascorbic acid in fruit juices .
5. Estimation of serum calcium.
6. Bone density measurements (visit to a nearby clinic).
7. Estimation of serum creatinine
8. Serum glutamate oxalo acetate transaminase
9. Serum glutamate pyruvate transaminase

Reference Books:

1. Textbook of Biochemistry with Clinical Correlations (2011) Devlin, T.M. John Wiley & Sons, Inc. (New York), ISBN: 978-0-4710-28173-4.
2. Immunology: A Short Course (2009) 6th ed., Coico, R and Sunshine, G., John Wiley & sons, Inc (New Jersey), ISBN: 978-0-470-08158-7
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4. Genetics (2012) 6th ed., Snustad, D.P. and Simmons, M.J., John Wiley & Sons. (Singapore), ISBN: