St. Joseph's College for Women (A)
Gnanapuram, Visakhapatnam
Syllabus and core structure for academic year 2025-26
COURSE STRUCTURE

Year	Sem	Course/ Category	Title of Course	Course Code	No. of Hr/Wk	No. of credits
I	I	Core	Biomolecules (T)	BCH Ma1 1801(3)	3	3
			Biomolecules (P)	BCH Ma1 1851(1)	2	1
		Core	Cell Biology (T)	BCH Ma2 1801 (3)	3	3
			Cell Biology (P)	BCH Ma2 1851 (1)	2	1
	II	Core	Genetics (T)	BCH Ma1 2801 (3)	3	3
			Genetics (P)	BCH Ma1 2851 (1)	2	1
		Core	General Physiology (T)	BCH Ma2 2801 (3)	3	3
			General Physiology (P)	BCH Ma2 2801 (1)	2	1
II	III	Core	Analytical Techniques (T)	BCH Ma1 3801 (3)	3	3
			Analytical Techniques (P)	BCH Ma1 3851 (1)	2	1
		Core	Basic Microbiology (T)	BCH Ma2 3801 (3)	3	3
			Basic Microbiology (P)	BCH Ma2 3851 (1)	2	1
		Core	General Physiology (T)	BCH Ma3 3801 (3)	3	3
			General Physiology (P)	BCH Ma3 3851 (1)	2	1
		Core	Genetics (T)	BCH Ma4 3801 (3)	3	3
			Genetics (P)	BCH Ma4 3851 (1)	2	1
	IV	Core	Bioenergetics And Metabolism Of Carbohydrates And Lipids (T)	BCH Ma1 4801 (3)	3	3
			Bioenergetics And Metabolism Of Carbohydrates And Lipids (p)	BCH Ma1 4851 (1)	2	1
		Core	Clinical Biochemistry (T)	BCH Ma2 4801 (3)	3	3
			Clinical Biochemistry (P)	BCH Ma2 4851 (1)	2	1
		Core	Immunology (T)	BCH Ma3 4801 (3)	3	3
			Immunology (P)	BCH Ma3 4851 (1)	2	1
III	V	Minor	Nutritional Biochemistry (T)	BCH Mi1 5801 (3)	3	3
			Nutritional Biochemistry (P)	BCH Mi1 5851 (3)	2	1
		Minor	Enzymology (T)	BCH Mi2 5801 (3)	3	3
			Enzymology (P)	BCH Mi2 5851 (3)	2	1

St. JOSEPH'S COLLEGE FOR WOMEN (AUTONOMOUS), VISAKHAPATNAM
w.e.f. AY 2025-26
I Semester
BIOMOLECULES

Code- BCH Ma1 1801 (3) Hours/Week: 3
Credits: 3

Course Objectives: By the end of this course the learner can:
1. Use various solvents, prepare different types of buffers based on need
2. Identify and classify carbohydrates based upon their properties.
3. Identify lipids and understand their physiological role
4. Learn and interpret the various organizations of protein structure
5. Correlate knowledge on nucleic acids with their physiological role and analyse quality of porphyrins and appreciate their biological significance

Course Outcomes: On completion of this course students will be able to:
1. Correlate the Physico - Chemical properties of Biomolecules to their structures
2. Compare and contrast the structure and functions of oligosaccharides and polysaccharides
3. Identify and establish the functional groups of Biomolecules such as Carbohydrates and Lipids
4. Explain the structure of peptide bond formation, and levels of protein structure
5. State the central dogma of molecular biology; recognize the structure of nucleic acids compare and contrast -DNA and RNA

UNIT-I
1. Fundamentals of Biochemistry:
1.1 History, scope and avenues of Biochemistry.
1.2 Water as a biological solvent.
1.3 Measurement of pH, Buffers, Biological relevance of Buffers.
1.4 Outlines of surface tension, adsorption and osmosis and their biological relevance.

UNIT-II
2. Carbohydrates:
2.1 Classification, monosaccharides, D and L designation, open chain and cyclic structures, epimers and anomers, mutarotation.
2.2 Reactions of carbohydrates (due to functional groups - hydroxyl, aldehyde and ketone. Amino sugars, Glycosides.
2.3 Structure and biological importance of disaccharides (sucrose, lactose, maltose)
2.4 Structure and biological importance of polysaccharides (starch, glycogen) and Glycosaminoglycans (very brief)

UNIT – III
3. Lipids:
3.1 Classification, saturated and unsaturated fatty acids, structure and properties of fats and oils (acid, saponification and iodine values, rancidity).

3.2 Classification of lipids
3.3 General properties and biological role of phospholipids.
3.4 Lipoproteins- types and functions.

UNIT-IV

4. Amino Acids and Proteins:

4.1 Classification, structure, stereochemistry, chemical reactions of amino acids due to carbonyl and amino groups.
4.2 Titration curve of glycine and pK values.
4.3 Non-protein amino acids,
4.4 Peptide bond - nature and conformation.
4.5 Protein classification based on solubility, shape, and function.
4.6 Denaturation and renaturation of proteins.
4.7 Structural organization of proteins- primary, secondary, tertiary, and quaternary structures

UNIT-V

5. Nucleic acids:

5.1 Types of RNA and DNA.
5.2 Structure of purines and pyrimidines, nucleosides, nucleotides.
5.3 Stability and formation of phosphodiester linkages.
5.4 Effect of acids, alkali and nucleases on DNA and RNA.
5.5 Structure of Nucleic acids- Watson-Crick DNA double helix structure
5.6 Denaturation and renaturation of nucleic acids,
5.7 Tm-values and their significance, cot curves and their significance.
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Recommended Books

1. Fundamentals of Biochemistry –Jain, J.L., Jain, S., Jain, N. S. Chand & Co.
2. Biochemistry – Satyanarayana. U and Chakrapani. U, Books & Allied Pvt. Lt
3. Nelson.D.L. and Cox.M..M -Lehninger’s Principles of Biochemistry- Freeman & Co.- 7 th Edition

St. JOSEPH'S COLLEGE FOR WOMEN (AUTONOMOUS), VISAKHAPATNAM
w.e.f. AY 2025-26
I SEMESTER
BIOMOLECULES PRACTICALS

Code- BCH Ma1 1851 (1) Hours/Week: 2
Credits -1

COURSE OBJECTIVES

To enable students to –

- Learn qualitative analysis of monosaccharides and disaccharides
- Prepare buffers as per the need of the experiment
- Analyse amino acids and lipids Qualitatively
- Analyse protein sample by various methods
- Determine pKa of amino acids

COURSE OUTCOMES

Student will be able to-

- Prepare buffers selectively as per the need of the experiment or biomolecule
- Differentiate carbohydrate by using qualitative tests
- Establish methods to differentiate various amino acids
- Analyse the quality of a given oil
- Understand pKa importance and determine it for amino acids

List of Experiments

1. Safety measures in Laboratory
2. Preparation of buffers (acidic, neutral, and alkaline) and determination of pH.
3. Qualitative identification of carbohydrates- glucose, fructose, ribose/xylose, maltose, sucrose, lactose, starch/glycogen.
4. Qualitative identification of amino acids- histidine, tyrosine, tryptophan, cysteine, arginine.
5. Qualitative identification of lipids- solubility, saponification, acrolein test, Salkowski test, Lieberman-Burchard test.
6. Determination of pKa of acetic acid and Glycine

Recommended Books

1. Fundamentals of Biochemistry –Jain, J.L., Jain, S., Jain, N. S. Chand & Co.
2. Biochemistry – Satyanarayana. U and Chakrapani. U, Books & Allied Pvt. Lt
3. Nelson.D.L. and Cox.M..M -Lehninger's Principles of Biochemistry- Freeman & Co.- 7 th Edition.

St. JOSEPH'S COLLEGE FOR WOMEN (AUTONOMOUS), VISAKHAPATNAM
w.e.f. AY 2025-26
I SEMESTER
CELL BIOLOGY

Code- BCH Ma2 1801 (3) Hours/ Week- 3
Credits -3

COURSE OBJECTIVES

To enable students to-

- Provide foundational knowledge on the historical development and structural organization of cells.
- Explain the structure and functions of various cell organelles and their role in cellular physiology.
- Impart a clear understanding of the nucleus, chromatin organization, and mechanisms of cell division.
- Elucidate the molecular regulation of the cell cycle, mitosis, meiosis, and programmed cell death.
- Analyse the structure, composition, and functional dynamics of biological membranes.

COURSE OUTCOMES

Students will be able to-

CO1- Explain historical background of cell biology and differentiate Prokaryotic and Eukaryotic cells

CO2- Illustrate structure of functions of cell organelles

CO3- Summarize structure of nuclear and interpret structure and functional domains of chromosomes

CO4- Discuss cell cycle and analyse role of cell cycle regulation factors

CO5- Identify chemical composition of membrane and explain biological membrane models

UNIT-I

1. Historical aspects and structure of cell:

1.1 Historical aspects: cell theory, protoplasm theory and organizational theory.

1.2 Broad classification of cell types: prokaryotic cell and eukaryotic cells, and their characteristics.

1.3 Ultrastructure of virus, bacterial, plant and animal cells.

UNIT-II

2. Cell organelles:

2.1. Structure and functions of: endoplasmic reticulum (rough endoplasmic reticulum and smooth endoplasmic reticulum), Golgi apparatus, lysosomes, centrioles, basal bodies, vacuoles, ribosomes and microbodies (peroxisomes and glyoxisomes).

2.2 Mitochondria: structure, function and organization of the respiratory chain.

2.3 Chloroplasts: structure, function and photophosphorylation.

UNIT-III

3. Organization of Nucleus & chromosomes and cell division:

3.1. Structure of the nucleus and the nuclear envelop and nuclear- pore complex.
3.2 Internal organization of the nucleus, the nuclear matrix and the nucleolus.
3.3 Supercoiling and organization of genomic DNA
3.4 chromosomes and higher order chromatin structure, functional domains within the nucleus.

UNIT-IV

4. Bio membranes:

4.1 Fluid mosaic model of biological membranes**.**
4.2 Chemical composition of Membranes- Lipid, proteins and carbohydrates
4.3 Composition of plasma and organelle membranes of animal and plant cells.
4.4 Distribution of membrane lipids- Membrane Fluidity
4.5 Assembly of membrane components.
4.6 Molecular structure of membranes: Miscelle, and liposomes.
4.7 Biological membrane structure: Symmetry of the membrane

UNIT- V

5. Cell division and regulation:

5.1 Phases of cell cycle
5.2 Mitosis and its regulation
5.3 Meiosis and its regulation
5.4 Inhibition of cell cycle progression
5.5 Regulation of cell cycle- Role of Cyclins, MPF, Cyclin dependent kinases, Growth factors, Nuclear Laminins
5.6 Apoptosis

Recommended Books

1. Goldman, Emanuel, and Lorrence H. Green, eds. Practical handbook of microbiology. CRC Press, 2015.
2. Dubey, R. C., and D. K. Maheshwari. Practical microbiology. S. Chand, 2002.
3. Microbiology: A laboratory manual by Cappuccino and Sherman, Pearson Education, 6th Ed

St. JOSEPH'S COLLEGE FOR WOMEN (AUTONOMOUS), VISAKHAPATNAM
w.e.f. AY 2025-26
I SEMESTER
CELL BIOLOGY PRACTICAL

Code- BCH Ma2 1851 (1) Hours/ Week- 2
Credits -1

COURSE OBJECTIVES

To enable students to-

- Develop practical skills in isolating and identifying subcellular organelles
- Impart hands-on experience in microscopic observation of cell division
- Enhance proficiency in staining techniques for visualization of plant and animal cell structures
- Provide experimental understanding of organelle functions and their significance
- Train students in scientific observation, analysis, and interpretation of cytological and organelle studies.

COURSE OUTCOMES

Students will be able to-

CO1- Isolate and identify chloroplasts and mitochondria from plant and animal tissues using standard laboratory techniques.

CO2- Examine and interpret the stages of mitosis and meiosis microscopically in onion root tip and flower bud cells.

CO3- Apply staining methods (methylene blue, Janus green) to visualize cell structures and subcellular organelles.

CO4- Correlate experimental findings with theoretical concepts of cell structure, organelles, and cell division.

CO5- Demonstrate competence in handling microscopes, preparing slides, and documenting observations in cell biology experiments.

Practical Syllabus

1. Isolation of Chloroplast
2. Isolation of Mitochondria from the liver
3. Mitosis experiment in onion
4. Meiosis experiment in onion
5. Visualization of animal and plant cells by Methylene blue
6. Staining and visualization of mitochondria by Janus green stain

Recommended Books

1. Goldman, Emanuel, and Lorrence H. Green, eds. Practical handbook of microbiology. CRC Press, 2015.
2. Dubey, R. C., and D. K. Maheshwari. Practical microbiology. S. Chand, 2002.
3. Microbiology: A laboratory manual by Cappuccino and Sherman, Pearson Education, 6th Ed

St. JOSEPH'S COLLEGE FOR WOMEN (AUTONOMOUS), VISAKHAPATNAM
w.e.f. AY 2025-26
II Semester
GENETICS

Course Code- BCH Ma1 2801(3)
Credits: 3 Hours/Week: 3

Course Objectives: By the end of this course the learner can:

1. Explain the fundamentals of genetics like DNA as genetic material, chromosome and gene and understand the gene arrangement in prokaryotes and eukaryotes.
2. Narrate organization of genes and their regulatory mechanisms
3. Understand bacterial genetics and transposable elements
4. Illustrate the life cycle of bacteriophages, their infection and defence mechanisms
5. Narrate the reasons for mutations and their inheritance

Course Outcomes: On completion of this course students will be able to:
1. Learn and understand the organization genetic material and its replication
2. Differentiate coding and non-coding sequences and gene regulation
3. Illustrate bacterial replications and characteristics of plasmids
4. Understand the life cycle of bacteriophages and their replication mechanisms
5. Impart reasons for mutations, causative agents and their inheritance.

UNIT-I
1. Genetic material (DNA and RNA)
1.1 Direct and Indirect evidences of DNA as genetic material, experimental proof.
1.2 Evidences of RNA as genetic material – eg. Virus.
1.3 Chromosome- Chromosome and gene
1.4 Chromosomal replication

UNIT-II
2. Gene arrangement
2.1 Gene – arrangements in prokaryotes and eukaryotes.
2.2 Concept of cistrons- Monocistronic and polycistronic
2.3 Gene structure in eukaryotic organisms- introns, exons, pseudogenes, and gene clusters, spacers, repetitive sequences.
2.3 Single and multiple copy genes in eukaryotes, eg – Histones, Alu, Copia, Satellite.
2.4 Gene regulatory mechanisms- Lac operon
2.5 Cell memory- Epigenetic modifications- DNA methylation
2.6 Extra nuclear inheritance- Mitochondrial inheritance

UNIT-III
3. Bacterial genetics
3.1 Bacterial chromosomes
3.2 General Characteristics and types of plasmids- Natural Plasmids and synthetic plasmids (pUC18, pBR322) and uses.

3.4 Transposable genetic elements- IS and Composite transposons- in brief
3.5 Recombination in Bacteria- Transformation, transduction, and conjugation

UNIT-IV

4. Bacteriophages and their molecular genetics

4.1 Structure of Bacteriophages- T-phage and Lambda phage and their use in the study of molecular genetics
4.2 Lytic cycle replication of T-phages
4.3 Lysogeny and its regulation.
4.4 Transduction – specialized, generalized and abortive.
4.5 Transfection and cosmids- in brief
4.6 Bacterial defence - outlines of CRISPR-Cas9

UNIT-V

5. Mutation

5.1 Types of mutations, mutagens, Mutagenesis
5.3 Induction and isolation of mutants- replica plating
5.4 Haploid genetic tools.
5.5 Radiation effects on human heredity
5.6 Phylogenetic inheritance.

RECOMMENDED BOOKS:

1. Molecular Genetics by D Friefelder
2. Cell molecular biology, Albert Bruce
3. Gene VII by Benjamin Lewin (2000). Oxford Univ. Press. London.
4. Molecular cloning by Maniatis and Co Vol I, II, III
5. Genetics by Gardner
6. Molecular Biology of the gene by Watson.
7. Genetics by G Zubay
8. Molecular Biology of the Cell by Albert Bruce.
9. Cell molecular Biology by Baltimore.
10. Molecular Biology by D Friefelder.
11. Cell and Molecular Biology 2ndEdit. (2002) By P. K. Gupta, Rastogi Publ.

St. JOSEPH'S COLLEGE FOR WOMEN (AUTONOMOUS), VISAKHAPATNAM
w.e.f. AY 2025-26
II Semester
GENETICS PRACTICALS

Course Code- BCH Ma1 2851(1)

Credits: 1 Hours/Week: 2

Course Objectives: By the end of this course the learner can:

1) Quantitate viruses by plaque assay
2) Perform restriction digestion
3) Explain and demonstrate ligation
4) Prepare competent cells for transformation and use them
5) Perform PCR based screening methods

Course Outcomes: On completion of this course students will be able to:

1. Isolate and determine viral load in samples
2. Perform and explain restriction digestion
3. Perform and explain ligation
4. Differentiate transformed cells from untransformed cells
5. Screen and identify cloned cells from others using PCR

List of Experiments

1. Isolation of phages from sewage and quantification by plaque assay.
2. Restriction digestion of the vector and the insert
3. Ligation of restricted DNA fragments
4. Preparation of competent E.coli cells, transformation and expression of cloned gene
5. PCR and restriction diagnosis-based identification of positive clones

RECOMMENDED BOOKS:

1. Molecular Genetics by D Friefelder
2. Cell molecular biology, Albert Bruce
3. Gene VII by Lewin
4. Molecular cloning by Maniatis and Co Vol I, II, III
5. Genetics by Gardner
6. Molecular Biology of the gene by Watson.
7. Genetics by G Zubay
8. Molecular Biology of the Cell by Albert Bruce.
9. Cell molecular Biology by Baltimore.
10. Molecular Biology by D Friefelder.
11. Genes VII Benjamin Lewin (2000). Oxford Univ. Press. London.
12. Cell and Molecular Biology 2ndEdit. (2002) By P. K. Gupta, Rastogi Publ.

St. JOSEPH'S COLLEGE FOR WOMEN (AUTONOMOUS), VISAKHAPATNAM
w.e.f. AY 2025-26
II Semester
GENERAL PHYSIOLOGY

Code- BCH Ma2 2801 (3)
Credits: 3 Hours/Week: 3

Course Objectives: By the end of this course the learner can:

1. To impart knowledge about blood composition and function and blood clotting mechanism.
2. To study about the muscular and nervous system.
3. To appreciate about the components of Urinary system and mechanism of Urine formation
4. To understand the structure and function and different components of Digestive system.
5. To introduce the organization of endocrine system and classification of hormones

Course Outcomes: On completion of this course students will be able to:
1. Elucidate composition of blood and perform blood grouping
2. Explain physiology of muscular system and nervous system
3. Understand and explain physiology of urine formation
4. Describe the physiology of Digestion
5. Illustrate the working of endocrine glands.

UNIT-I
1. Blood- composition and functions
1.1 Blood composition- Plasma, types of blood cells, morphology & function - RBC, WBC, platelets
1.2 Erythropoiesis
1.3 Blood groups- A B O & Rhesus system
1.4 Function of plasma proteins.
1.5 Blood clotting mechanism and anticoagulants

UNIT-II
2. Neuromuscular system
2.1 Muscular system- types of muscle & functions.
2.2 Brief outline of nervous system
2.3 Structure of Neuron
2.4 Synapses- chemical and electrical synapse
2.5 Nerve impulse transmission
2.4 Neurotransmitters.

UNIT-III
3. Excretory system
3.1 Urinary system – components of the urinary system,
3.2 Kidney structure and organization.
3.3 Structure, function and classification of nephrons.
3.4 Mechanism of urine formation

3.5 Importance of glomerular filtration rate

UNIT-IV

4. Digestive system

4.1Digestive system- components of digestive system
4.2 Role of hormones and enzymes in digestive process
4.3 Mechanism of secretion of HCl,
4.4 Mechanism of digestion of carbohydrates, lipids and proteins

UNIT-V

5. Endocrine system

5.1 General organization of endocrine system- classification of hormones.
5.2 Biological functions - Thyroid, Para Thyroid, Insulin, Glucagon, hormones of the adrenal glands and gonadal hormones.

Reference Books

1. Textbook of Medical Physiology – Guyton & Hall, 11th edition ,2006
2. Davidson's Principles and Practice of Medicine (XX Edition)- John.A. A. Hunter
3. Human Anatomy & Physiology – Elaine N.Marieb ,3rd edition ,1995
4. Essentials of Medical Physiology –Sembulingam ,1999 5. Medical Physiology Ganong
5. Text book of Medical Biochemistry Physiology – MN.Chatterjee and , Rana Shinde,7th edition.
6. Animal physiology – Mariakuttikan and Arumugam

St. JOSEPH'S COLLEGE FOR WOMEN (AUTONOMOUS), VISAKHAPATNAM
w.e.f. AY 2025-26
II Semester
GENERAL PHYSIOLOGY PRACTICAL

Code- BCH Ma2 2851 (1)

Credits: 1 Hours/Week: 2

Course Objectives: By the end of this course the learner can:

1) Narrate working of microscope.
2) Perform staining of blood cells and visualization
3) Determine count of Blood groups.
4) Measure Blood pressure
5) Illustrate identification characteristics of tissue through permanent slides

Course Outcomes: On completion of this course students will be able to:

1. Recognize and analyse blood cells
2. Estimate haemoglobin in blood
3. Determine blood groups
4. Measure blood pressure using equipment
5. Narrate identification characteristics of tissue by microscopy

List of Experiments

1. RBC count & WBC count
2. Differential leucocyte count by Leishman' s staining
3. Estimation of Haemoglobin by Sahli's acid haematin method
4. Determination of Erythrocyte sedimentation rate (ESR)
5. Determination of blood group
6. Measurement of Blood pressure
7. Histology of connective tissue, liver/ kidney permanent slides

Reference Books

1. Davidson's Principles and Practice of Medicine (XX Edition)- John.A. A. Hunter
2. Human Anatomy & Physiology – Elaine N.Marieb ,3rd edition ,1995
3. Essentials of Medical Physiology –Sembulingam ,1999 5. Medical Physiology Ganong

St. JOSEPH'S COLLEGE FOR WOMEN (AUTONOMOUS), VISAKHAPATNAM
w.e.f. AY 2024-25
III Semester
ANALYTICAL TECHNIQUES

Code- BCH Ma1 3801 (3)
Credits: 3 Hours/Week: 3

Course Objectives: By the end of this course the learner can:
1. Identify usage of homogenization methods
2. Learn Principles of Electrophoresis and their applications.
3. Gain Knowledge on centrifugation methods and principles involved
4. Understand calorimetry and spectrophotometry
5. Imbibe knowledge on radioisotopes and measurements

Course Outcomes: On completion of this course students will be able to:
1. Perform tissue homogenization based on sample sources and use appropriate chromatography techniques
2. Perform electrophoresis and separate samples based on their properties
3. Compare various centrifugation methods available and their principles invovled
4. Illustrate Beer-Lambert's Law and generate Absorption maxima for biological samples
5. Explain the applications, hazards and precautions of various radioisotopes

UNIT-I
1. Methods of tissue homogenization and Chromatography
1.1 Salt and organic solvent extraction and fractionation.
1.2 Dialysis, Reverse dialysis, ultra filtration, lyophilization.
1.3 Chromatography: principle, procedure and application of partition chromatography, adsorption chromatography, ion exchange chromatography, gel chromatography, affinity chromatography, GLC and HPLC.

UNIT-II
2. Electrophoresis:
2.1 Basic introduction to free flow, zone electrophoresis.
2.2 Principle, procedure and application of Paper electrophoresis
2.3 Principle, procedure and application of Gel electrophoresis (PAGE, SDS-PAGE and capillary electrophoresis
2.4 Principle, procedure and application of Isoelectric focusing
2.5 Outlines of Principle, procedure and applications of High voltage electrophoresis, Pulse field electrophoresis, Immunoelectrophoresis.

UNIT-III
3. Centrifugation:
3.1 Principle of sedimentation technique.
3.2 Different types of centrifuges and rotors.
3.3 Principle, procedure and application of differential centrifugation,

3.4 Principle, procedure and application of density gradient centrifugation and types,
3.5 Principle, procedure and application of ultra centrifugation,

UNIT-IV

4. Colorimetry and spectrophotometry:

4.1 Laws of light absorption -Beer - Lambert's law.
4.2 Principle and instrumentation of colorimetry and spectrophotometry.
4.3 Molar extinction coefficient and quantitation.
4.4 Principle of fluorometry and Atomic absorption spectrophotometer

UNIT-V

5. Radioisotopes:

5.1 Important stable radioisotopes used in biochemical research. P^{32}, I 125, I131, Co 60. C 14 etc.
5.2 Radiation hazards and precautions taken while handling radioisotopes.
5.3 Principle and application of RIA.
5.4 Measurement of radioactivity by GM counter

Reference Books

1. Physical Biochemistry- Application to Biochemistry and Molecular Biology: Friefelder D. WH Freeman and Company
2. Principles and Techniques of Biochemistry and Molecular Biology: - Ed. K. Wilson and J. Walker, Cambridge University Press.
3. The Tools of Biochemistry: Cooper T.G., John Wiley and Sons Publication.
4. Biophysical chemistry. Principles and Techniques: Upadhayay A, Upadhayay K and Nath N., Himalaya publishing house.
5. Experimental Biochemistry. Cark Jr J. M. and Switzer R.L, W.H. Freeman and Company.
6. Research Methodology for Biological Sciences: Gurumani. N. M.J.P. Publishers., Chennai, India.
7. Instrumental Methods of Chemical Analysis: Chatwal. G and Anand.S., Himalaya Publishing House, Mumbai, India.
7. A Biologist's Guide to Principles and Techniques of Practical Biochemistry: Williams. B.L. and Wilson. K. (ed.) Edward Arnold Ltd. London
8. Jayaraman, J. (2011). Laboratory Manual in Biochemistry, New Age International (P) Ltd.
9. Sadasivam, S. and Manickam, A. (2005). Biochemical Methods, Second edition, New Age International (P) Ltd.

St. JOSEPH'S COLLEGE FOR WOMEN (AUTONOMOUS), VISAKHAPATNAM
w.e.f. AY 2024-25
III Semester
ANALYTICAL TECHNIQUES PRACTICAL

Code- BCH Ma1 3851 (1)

Credits: 1 Hours/Week: 2

Course Objectives: By the end of this course the learner can:

1. Identify Ascorbic acid in fruits
2. Learn Principles of basic agarose gel Electrophoresis
3. Estimate vitamins and minerals
4. Understand lipid characterization protocols
5. Learn working of Soxhlet equipment

Course Outcomes: On completion of this course students will be able to:

1. Estimate Vitamin C content in food samples
2. Extract and estimate plant pigments and vitamins
3. Extimate phosphate content in food and microbial samples
4. Analyse and characterise quality of lipids
5. Extract oil and organic molecules by Soxhlet method

List of Experiments

1. Estimation of ascorbic acid
2. Separation and estimation of total carotenoids and β-carotene
3. Extraction and estimation of vitamin A, vitamin E, niacin and free amin acid concentration.
4. Estimation of phosphorus by Fiske and Subbarow method
5. Characterization of fats – estimation of saponification number, iodine number, acid number and R. M. Number
6. Extraction of Phytoconstituents by Soxhlet and quantification

Reference Books

1. Physical Biochemistry- Application to Biochemistry and Molecular Biology: Friefelder D. WH Freeman and Company
2. Principles and Techniques of Biochemistry and Molecular Biology: - Ed. K. Wilson and J. Walker, Cambridge University Press.
3. The Tools of Biochemistry: Cooper T.G., John Wiley and Sons Publication.
4. Biophysical chemistry. Principles and Techniques: Upadhayay A, Upadhayay K and Nath N., Himalaya publishing house.
5. Experimental Biochemistry. Cark Jr J. M. and Switzer R.L, W.H. Freeman and Company.

St. JOSEPH'S COLLEGE FOR WOMEN (AUTONOMOUS), VISAKHAPATNAM
w.e.f. AY 2024-25
III Semester
BASIC MICROBIOLOGY

Code- BCH Ma2 3801 (3)
Credits: 3 Hours/Week: 3

Course Objectives: By the end of this course the learner can:
1. understanding the fundamentals of Microbiology
2. Gain knowledge on characteristics and biology of molds, yeast and actinomycetes etc.
3. Learn about microbial interactions and microbial diseases.
4. Gain knowledge on pathogenesis and insights on few bacterial diseases
5. Classify virus based on structure and also explain some about some viral diseases.

Course Outcomes: On completion of this course students will be able to:
1. Classify, isolate, stain and culture bacteria in sterile conditions
2. Illustrate about fungi, algae and mycoplasma in detail and also their characteristics
3. Narrate modes of microbial interaction and evaluate reasons for food spoilage
4. Illustrate the method of invasion, multiplication of some bacteria in some diseases
5. Explain virus characteristics, their assay methods and diseases caused by them

UNIT-I
1. Morphology and classification of bacteria:
1.1 Morphology and classification of bacteria – phenotype, numerical and phylogenetic tree - rRNA, DNA and Proteins,
1.2 Microbial diversity,
1.3 Major characteristics used in taxonomy – morphological, physiological and metabolic, ecological, genetic analysis and molecular characterizations- (protein, nucleic acid composition),
1.4 Isolation and cultivation of bacteria,
1.5 Bacterial growth curves.
1.6 Culture media and methods,
1.7 Staining techniques, differences between Gram-positive and Gram-negative bacteria.
1.8 Methods of sterilization and Pasteurization.

UNIT-II
2. Molds and Algae
2.1 Molds – characteristics, classification and reproduction.
2.2 Yeasts – morphology, characteristics, and reproduction.
2.3 General characteristics of Actinomycetes, Rickettsiae, Spirochaetes and mycoplasma.
2.4 Economical and industrial uses of algae.

UNIT-III
3. Microbial interactions and food borne diseases
3.1 Microbial interactions – mutualism, protocooperation, commensalism, predation, parasitism, amensalism, competition, symbiosis in complex system.

3.2 Role of microorganisms in domestic and industrial sewage.
3.3 Microbiology of fermented foods, food spoilage and its control (Preservation).
3.4 Food borne diseases – Botulism, Salmonellosis, E. colidiarrhoea, Shigellosis, Staphylococcal food poisoning

UNIT-IV

4. Microbial diseases

4.1 Microbial diseases-Pathogenesis of bacterial diseases – maintenance, transport, invasion and multiplication and regulation.
4.2 Airborne diseases–Diphtheria, Meningitis, Pneumonia, Tuberculosis and Streptococcal diseases.
4.3 Arthropod borne – Lyme, Plague.
4.4 Direct contact – Anthrax, Gonorrhoea, Conjunctivitis, Gastritis, Syphilis, Tetanus, Leprosy, Staphylococcal diseases.
4.5 Sepsis, Mycoses, Malaria, Amoebiasis, Candidiasis

UNIT-V

5. Virus characteristics and diseases

5.1 Viruses- classification, structure, and replication.
5.2 Methods of assay and cultivation chicken embryo, animal inoculation and tissue culture, quantification and propagation.
5.3 Maintenance of animal and plant viruses.
5.4 Tumour viruses.
5.5 Viral diseases – Dengue, Hepatitis, HIV, Polio, Rabies, SARS.
5.6 Inactivation of viruses – photodynamic inactivation.
5.7 Antiviral agents- chemical and biological agents

Reference Books

1. Vasanthakumari.R, (2009) Practical Microbiology, BI Publishers Pvt Ltd, India
2. Dubey.R.C and Maheshwari D.K., (2002), Practical Microbiology, S.Chand& comp Ltd, NewDelhi.
3. Microbiology by Pelczar, Chan and Krieg 5th edn. 1995 Mc Grew- Hill.
4. General Microbiology: Boyd, R.F., Times Mirror/ Mosby College, 1984.
5. A Textbook of Microbiology, R.C.Dubey and D.K.Maheswari, S.Chand Co (2001).
6. Pharmaceutical Microbiology, By Hugo and Russell, Blackwell Scientific (1987).
7. An Introduction to Viruses by S.B.Biswas, Vikas Publishing house.
8. Microbiology 4th edition, Prescott, Harley, Klein (Mc grew Hill)
9. Fundamentals of Microbiology – M. Frebisher.

St. JOSEPH'S COLLEGE FOR WOMEN (AUTONOMOUS), VISAKHAPATNAM
w.e.f. AY 2024-25
III Semester
BASIC MICROBIOLOGY PRACTICALS

Code- BCH Ma2 3851 (1)

Credits: 1 Hours/Week: 2

Course Objectives: By the end of this course the learner can:

1) To understand various methods involved in sterilization and preparation of media.
2) Perform staining techniques
3) Understand the methods of isolation of microbes from various sources.
4) To impart knowledge about Biochemical tests.
5) Perform and draw the growth curve of microbes.

Course Outcomes: On completion of this course students will be able to:

1. Understand the concept of basic microbiology – sterilization techniques.
2. Know about the isolation of microorganisms from various sources.
3. Discuss the staining techniques to study the morphology of microorganisms.
4. Describe the antibiotic activity
5. Infer the importance of various biochemical test.

List of Experiments

1. Sterilization Techniques-Autoclaving, hot-air oven sterilization, Sieve filtration, membrane filtration.
2. Preparation of culture media – Nutrient Broth, Nutrient Agar, Blood agar Mac Conkey's agar, Potato dextrose agar.
3. Isolation of bacteria – Streak plate and pour plate methods
4. Identification of bacteria by staining techniques – simple, differential, Gram staining and acid-fast staining.
5. Identification of bacteria – Morphological, cultural and biochemical characteristics
6. Motility of Bacteria – "Hanging drop" technique
7. Bacteriological examination of water and milk
8. Bacterial growth curve

Reference Books

1. Vasanthakumari.R, (2009) Practical Microbiology, BI Publishers Pvt Ltd, India
2. Dubey.R.C and Maheshwari D.K., (2002), Practical Microbiology, S.Chand& comp Ltd, NewDelhi.
4. Microbiology 4th edition, Prescott, Harley, Klein (Mc grew Hill)
5. Fundamentals of Microbiology – M. Frebisher.

St. JOSEPH'S COLLEGE FOR WOMEN (AUTONOMOUS), VISAKHAPATNAM
w.e.f. AY 2024-25
III Semester
GENERAL PHYSIOLOGY

Code: BCH Ma3 3801 (3)
Credits: 3 Hours/Week: 3

Course Objectives: By the end of this course the learner can:

1. To impart knowledge about blood composition and function and blood clotting mechanism.
2. To study about the muscular and nervous system.
3. To appreciate about the components of Urinary system and mechanism of Urine formation
4. To understand the structure and function and different components of Digestive system.
5. To introduce the organization of endocrine system and classification of hormones

Course Outcomes: On completion of this course students will be able to:
1. Elucidate composition of blood and perform blood grouping
2. Explain physiology of muscular system and nervous system
3. Understand and explain physiology of urine formation
4. Describe the physiology of Digestion
5. Illustrate the working of endocrine glands.

UNIT-I
1. Blood- composition and functions
1.1 Blood- composition & function.
1.2 Types of blood cells, morphology & function - RBC, WBC, platelets erythropoiesis.
1.3 Blood groups- A B O & Rhesus system; Coomb's test, Bombay blood group,
1.4 Function of plasma proteins.
1.5 Composition & functions of lymph & lymphoid system,
1.6 Blood clotting mechanism and anticoagulants

UNIT-II
2. Neuromuscular system
2.1 Muscular system- types of muscle & functions.
2.2 Brief outline of nervous system, structure of brain and spinal cord.
2.3 Synapses- chemical and electrical synapse, nerve impulse, action potential
2.4 Neurotransmitters.

UNIT-III
3. Excretory system
3.1 Urinary system – components of the urinary system,
3.2 Kidney structure and organization.
3.3 Structure, function and classification of nephrons.
3.4 Mechanism of urine formation- functions of glomerular filtration rate and selective reabsorption and tubular secretion.

UNIT-IV

4. Digestive system

4.1Digestive system- structure and function of different components of digestive system,
4.2 Mechanism of secretion of HCL,
4.3 Role of hormones and enzymes in digestive process.
4.4 Digestion of carbohydrates, lipids, and proteins

UNIT-V

5. Endocrine system

5.1 General organization of endocrine system- classification of hormones.
5.2 Biological functions - Thyroid, Para Thyroid, Insulin, Glucagon, hormones of the adrenal glands and gonadal hormones.

Reference Books

1. Textbook of Medical Physiology – Guyton & Hall, 11th edition ,2006
2. Davidson's Principles and Practice of Medicine (XX Edition)- John.A. A. Hunter
3. Human Anatomy & Physiology – Elaine N.Marieb ,3rd edition ,1995
4. Essentials of Medical Physiology –Sembulingam ,1999 5. Medical Physiology Ganong
5. Text book of Medical Biochemistry Physiology – MN.Chatterjee and , Rana Shinde,7th edition.
6. Animal physiology – Mariakuttikan and Arumugam

St. JOSEPH'S COLLEGE FOR WOMEN (AUTONOMOUS), VISAKHAPATNAM
w.e.f. AY 2024-25
III Semester
GENERAL PHYSIOLOGY PRACTICALS

Code: BCH Ma3 3851 (1)

Credits: 1 Hours/Week: 2

Course Objectives: By the end of this course the learner can:

1) Narrate working of microscope.
2) Perform staining of blood cells and visualization
3) Determine count of blood cells.
4) Perform ESR and Packed cell volume
5) Perform blood grouping

Course Outcomes: On completion of this course students will be able to:

1. Recognize and analyse blood cells
2. Estimate haemoglobin in blood
3. Determine blood groups
4. Evaluate Packed cell volume and ESR.
5. Determine coagulation time and explain its importance

List of Experiments

1. Microscopy
2. RBC count & WBC count
3. Differential leucocyte count by Leishman' s staining
4. Estimation of Hemoglobin by Sahli's acid haematin method
5. Determination of Packed cell volume (PCV)
6. Determination of Erythrocyte sedimentation rate (ESR)
7. Determination of Coagulation time & Bleeding time
8. Determination of blood group

Reference Books

1. Davidson's Principles and Practice of Medicine (XX Edition)- John.A. A. Hunter
2. Human Anatomy & Physiology – Elaine N.Marieb ,3rd edition ,1995
3. Essentials of Medical Physiology –Sembulingam ,1999 5. Medical Physiology Ganong

St. JOSEPH'S COLLEGE FOR WOMEN (AUTONOMOUS), VISAKHAPATNAM
w.e.f. AY 2024-25
III Semester
GENETICS

Code- BCH Ma4 3801 (3)
Credits: 3 Hours/Week: 3

Course Objectives: By the end of this course the learner can:

1. Explain the fundamentals of genetics like DNA as genetic material, chromosome and gene and understand the gene arrangement in prokaryotes and eukaryotes.
2. Narrate organization of genes and their regulatory mechanisms
3. Understand bacterial genetics and transposable elements
4. Illustrate the life cycle co bacteriophages, their infection and defence mechanisms
5. Narrate the reasons for mutations and their inheritance

Course Outcomes: On completion of this course students will be able to:
1. Learn and understand the organization genetic material and its replication
2. Differentiate coding and non-coding sequences and gene regulation
3. Illustrate bacterial replications and characteristics of plasmids
4. Understand the life cycle of bacteriophages and their replication mechanisms
5. Impart reasons for mutations, causative agents and their inheritance.

UNIT-I
1. Genetic material (DNA and RNA)
1.1 Direct and Indirect evidences of DNA as genetic material, experimental proof.
1.2 Evidences of RNA as genetic material – eg. Virus.
1.3 Chromosome- structure of chromatin - nucleosomes and higher orders of organization
1.4 Chromosomal replication
1.5 Genetic mapping of chromosomes
1.6 Chromosome banding
1.7 Transposition in human chromosome and chromosomal abnormalities

UNIT-II
2. Gene arrangement
2.1 Gene – arrangements in prokaryotes and eukaryotes.
2.2 Gene structure in eukaryotic organisms- introns, exons, pseudogenes, and gene clusters, spacers, repetitive sequences.
2.3 Single and multiple copy genes in eukaryotes, eg – Histones, Alu, Copia, Satellite.
2.4 Mapping of human genes – techniques used, assignment of important genes.
2.5 Gene regulatory mechanisms and cell memory.
2.6 Mechanism of recombination, extra nuclear inheritance.
2.7 Non-coding explosion, cell fate determination and reprogramming.

UNIT-III

3. Bacterial genetics

3.1 Bacterial chromosomes,
3.2 Plasmids – fertility, resistance, colicinogenic and other,
3.3 PBR322 and other synthetic plasmids - isolation and uses.
3.4 Transposable genetic elements
3.5 Transformation, transduction, and conjugation in bacteria.
3.6 Linkage map of bacterial chromosome.
3.7 Recombination in bacteria.

UNIT-IV

4. Bacteriophages and their molecular genetics

4.1 Structure of Bacteriophages and their use in the study of molecular genetics
4.2 lytic cycle replication of T-phages,
4.3 Lysogeny and its regulation.
4.4 Transduction – specialized, generalized and abortive.
4.5 Transfection
4.6 Cosmids.
4.7 Fine structure analysis of T- phages
4.8 Benzers work and concept of cistrons.
4.9 Bacterial defence (CRISPR- Gene turning on).

UNIT-V

5. Mutation

5.1 Types of mutations, mutagens, mechanism of mutation
5.2 Mutagenesis
5.3 Induction and isolation of mutants.
5.4 Haploid genetic tools.
5.5 Radiation effects on human heredity- Phylogenetic inheritance.
5.6 Heritability and its measurements and mapping
5.7 Gene duplication and self-incompatibility.

RECOMMENDED BOOKS:

1. Molecular Genetics by D Friefelder
2. Cell molecular biology, Albert Bruce
3. Gene VII by Lewin
4. Molecular cloning by Maniatis and Co Vol I, II, III
5. Genetics by Gardner
6. Molecular Biology of the gene by Watson.
7. Genetics by G Zubay
8. Molecular Biology of the Cell by Albert Bruce.
9. Cell molecular Biology by Baltimore.
10. Molecular Biology by D Friefelder.
11. Genes VII Benjamin Lewin (2000). Oxford Univ. Press. London.
12. Cell and Molecular Biology 2ndEdit. (2002) By P. K. Gupta, Rastogi Publ.

St. JOSEPH'S COLLEGE FOR WOMEN (AUTONOMOUS), VISAKHAPATNAM
w.e.f. AY 2024-25
III Semester
GENETICS PRACTICALS

Code- BCH Ma4 3851 (1)

Credits: 1 Hours/Week: 2

Course Objectives: By the end of this course the learner can:

1) Quantitate viruses by plaque assay
2) Perform PCR technique
3) Perform restriction digestion and ligation
4) Prepare competent cells for transformation and use them
5) Perform PCR based screening methods

Course Outcomes: On completion of this course students will be able to:

1. Isolate and determine viral load in samples
2. Explain and demonstrate PCR
3. Perform and explain restriction digestion and ligation
4. Differentiate transformed cells from untransformed cells
5. Screen and identify cloned cells from others using PCR

List of Experiments

1. Isolation of phages from sewage and quantification by plaque assay.
2. PCR amplification of insert
3. Restriction digestion of the vector and the insert
4. Ligation of restricted DNA fragments
5. Preparation of competent E.coli cells, transformation and expression of cloned gene
6. PCR and restriction diagnosis-based identification of positive clones

RECOMMENDED BOOKS:

1. Molecular Genetics by D Friefelder
2. Cell molecular biology, Albert Bruce
3. Gene VII by Lewin
4. Molecular cloning by Maniatis and Co Vol I, II, III
5. Genetics by Gardner
6. Molecular Biology of the gene by Watson.
7. Genetics by G Zubay
8. Molecular Biology of the Cell by Albert Bruce.
9. Cell molecular Biology by Baltimore.
10. Molecular Biology by D Friefelder.
11. Genes VII Benjamin Lewin (2000). Oxford Univ. Press. London.
12. Cell and Molecular Biology 2ndEdit. (2002) By P. K. Gupta, Rastogi Publ.

St. JOSEPH'S COLLEGE FOR WOMEN (AUTONOMOUS), VISAKHAPATNAM
w.e.f. AY 2023-24
IV Semester
BIOENERGETICS AND METABOLISM OF CARBOHYDRATES AND LIPIDS
Code- BCH Ma1 4801 (3)
Credits: 3 Hours/Week: 3

Course Objectives: By the end of this course the learner can:
1. Learn principles of Thermodynamics
2. Acquire knowledge on Electron transport chain and Oxidative phosphorylation
3. Understand fundamental concepts of Carbohydrate metabolism
4. Learn biosynthesis and degradation of lipids
5. Imbibe knowledge on phospholipids, sphingolipids and cholesterol

Course Outcomes: On completion of this course students will be able to:
1. Illustrate energy flow in biological systems
2. Narrate the complete concept of Electron transport chain and Oxidative phosphorylation
3. Explain carbohydrate metabolic pathways and inborn errors associated with it
4. Illustrate biosynthesis and degradation of lipids
5. Explain role of liver in metabolic pathways

UNIT-I
1. Principles of thermodynamics:
1.1 Free energy, enthalpy and entropy.
1.2 Free energy changes in biological transformations in living systems.
1.3 Redox potential, phosphate group transfer potential and ATP
1.4 High-energy compounds
1.5 Oxidation and reduction reactions.

UNIT-II
2. Electron Transport chain and Oxidative phosphorylation
2.1 Introduction to Oxidative phosphorylation
2.2 Outlines of Reducing equivalents,
2.3 Electron transport chain and its carriers-Complex I, II, III, IV;
2.4 Mitchell's Hypothesis—experimental verification (brief), Determination of P:O ratio
2.5 ATP synthesis by F1-FO ATP synthase, E. Racker's experiment, Relation of proton movement and ATP synthesis.
2.6 Oxidation and reduction enzymes, utilization of oxygen by oxygenase's, superoxide dismutase and catalase.
2.7 Respiratory control- Mechanism, and theories of oxidative phosphorylation.
2.8 Respiratory chain inhibitors and uncouplers of oxidative phosphorylation.
2.9 Bioluminescence.

UNIT-III

3. Carbohydrate metabolism

3.1 Glucose as fuel, glucose transporters.
3.2 Glycolysis, and its regulation. Substrate cycling.
3.3 TCA cycle – function and regulation,
3.4 Glyoxylate cycle, Gluconeogenesis, and its regulation
3.5 HMP shunt and its significance,
3.6 Glycogen metabolism and its regulation with special reference to phosphorylase and glycogen synthase
3.7 Inborn errors of carbohydrate metabolism.

UNIT-IV

4. Lipid metabolism

4.1 Oxidation of fatty acids
4.2 Biosynthesis of fatty acids and regulation;
4.3 Metabolism of arachidonic acid
4.4 Biosynthesis of triglycerides.

UNIT-V

5. Metabolism of lipids

5.1 Brief outlines of Metabolism of phospholipids, sphingolipids.
5.2 Biosynthesis of cholesterol and its regulation in brief
5.3 Role of liver and adipose tissue in lipid metabolism.
5.4 In born errors of lipid metabolism

RECOMMENDED BOOKS

1. Principles of Biochemistry, White. A, Handler, P and Smith.
2. Biochemistry, Lehninger A.L.
3. Biochemistry, David E. Metzler.
4. Biochemistry, LubertStryer.
5. Text of Biochemistry, West and Todd.

St. JOSEPH'S COLLEGE FOR WOMEN (AUTONOMOUS), VISAKHAPATNAM
w.e.f. AY 2023-24
IV Semester
BIOENERGETICS AND METABOLISM OF CARBOHYDRATES AND LIPIDS PRACTICALS

Code- BCH Ma1 4851 (1)
Credits: 1 Hours/Week: 2

Course Objectives: By the end of this course the learner can:
1. Learn protocol for isolation of casein and lactalbumin from milk
2. Acquire knowledge on estimation of glucose
3. Estimate urea and creatinine in serum
4. Learn protocol estimation of cholesterol
5. Perform protocol for estimation of glucose

Course Outcomes: On completion of this course students will be able to:
1. Isolate casein and lactalbumin from milk
2. Estimate reducing sugars in food samples and urine
3. Analyse glucose in urine using titrimetric method
4. Estimate serum for urea and creatine
5. Analyse serum cholesterol

PRACTICAL SYLLABUS
1. Isolation of casein from milk
2. Preparation of lactalbumin from milk
3. Estimation of reducing sugar by DNS (Dinitrosalicylic acid) method
4. Titration of glucose by Benedict's method
5. Estimation of urea by Diacetylmonoxime method
6. Estimation of creatinine in serum
7. Estimation of cholesterol by ZAK's method

RECOMMENDED BOOKS
1. Principles of Biochemistry, White. A, Handler, P and Smith.
2. Biochemistry, Lehninger A.L.
3. Biochemistry, David E. Metzler.
4. Biochemistry, LubertStryer.
5. Text of Biochemistry, West and Todd.

St. JOSEPH'S COLLEGE FOR WOMEN (AUTONOMOUS), VISAKHAPATNAM
w.e.f. AY 2023-24
IV Semester
IMMUNOLOGY

Code: BCH Ma3 4801 (3)
Credits: 3 Hours/Week: 3

Course Objectives: By the end of this course the learner can:
1. Learn basic equipment in a Clinical Biochemistry laboratory
2. Acquire knowledge on Haemoglobin related disorders
3. Understand fundamental of Renal and Gastric functioning
4. Learn basic tests used to analyse pancreas and liver
5. Imbibe knowledge on clinically importance enzymes

Course Outcomes: On completion of this course students will be able to:
1. Illustrate and establish a Clinical Biochemistry laboratory that is automated
2. Narrate the reasons behind the hemoglobinopathies and anaemias
3. Explain reasons for renal and gastric failure and analyse the test
4. Illustrate functions of liver and its related disorders
5. Explain role of enzymes in clinical diagnostics

UNIT-I
Introduction to Immune System
1.1 Introduction and overview of defence mechanisms in plants and animals
1.2 Hematopoiesis
1.3 Cells of the immune system
1.4 Organs of the immune system- primary and secondary lymphoid organs and tissues.

UNIT-II
Innate immunity in plants and animals
2.1 Plants - Chemical and morphological defence in plants; elicitors, receptors,
2.2 Basal resistance, and innate biochemical host defences
2.3 Animals -Anatomical barriers, Cell types of Innate Immunity
2.4 Pattern Recognition Receptor (PRR)
2.5 Connections between innate and adaptive immunity
2.6 Cell adhesion molecules, Chemokines, leukocyte extravasation
2.7 Localized and systemic response.
2.8 Complement activation by classical, and alternate pathway
2.9 Biological consequences of complement activation.

UNIT-III
Adaptive Immunity in Plants and Animals
3.1 Plants - Biotic- interactions with symbionts, pathogens.
3.2 Biochemical host defences, Basal resistance and basic compatibility

3.3 Gene for gene concept
3.4 Interaction in host-pathogen systems, receptor-elicitor model, plant gene-gene interaction.
3.5 Cytological protection and induced resistance.
3.6 Passive and active defences.
3.7 Animals - Antigens and haptens, Factors that dictate immunogenicity, B and T cell epitopes.

UNIT-IV

Immunoglobulins and HLA system:

4.1 Structure and distribution of classes and subclasses of immunoglobulins (Ig)
4.2 Ig fold, effector functions of antibody
4.3 Antigenic determinants on Ig and Ig super family.
4.4 Generation of antibody Diversity.
4.5 Monoclonal antibodies
4.6 Immunological methods- Antigen-antibody interactions
4.7 Histocompatibility antigens - MHC, HLA and Disease
4.8 T and B cell - Maturation, activation and effector response, Positive and Negative selection
4.9 APC and Antigen Presentation,
4.10 Cytokines and Chemokines.

UNIT-V

Immune dysfunction and applications

4.1 Immunological tolerance
4.2 Immunological disorders – Hypersensitivity,
4.3 Autoimmune diseases.
4.4 Immunodeficiencies
4.5 Transplantation Immunology
4.6 Immune response against major classes of pathogens.

RECOMMENDED BOOKS

1. Gowenlock, A.H. and Donald, J(2002). Varley's practical clinical Biochemistry, sixth edition, CBS publications and Distributors, New Delhi.
2. Sembulingam, K and Sembulingam, P(2010). Essentials of Medical Physiology, fifth edition. Jaypae Brothers (p) ltd, New Delhi.
3. Burtis and Ashwood (2007) Tietz Fundamentals of Clinical chemistry, 6th edition, WB Saunders Company, Oxford Science Publications USA.
4. Chatterjee and Shindae(2012). Text book of medical biochemistry, 8th edition.
5. Devlin, T.M(2010). Text Book of Biochemistry with clinical correlations, 7th edition. NewYork.
6. Gans, G and Murphy, J.M. (2008). Clinical Biochemistry, fourth edition, Churchill Livingstone, Elsevier

St. JOSEPH'S COLLEGE FOR WOMEN (AUTONOMOUS), VISAKHAPATNAM
w.e.f. AY 2023-24
IV Semester
IMMUNOLOGY PRACTICALS

Credits: 2 Hours/Week: 3

Course Objectives: By the end of this course the learner can:
1. Understand structural plant defense mechanisms.
2. Gain hands-on skills in immunodiffusion and immunoelectrophoresis techniques.
3. Learn methods of spleen cell isolation and counting.
4. Perform and interpret ABO and Rh blood grouping.
5. Apply immunological assays like latex agglutination and immunoprecipitation.

Course Outcomes: On completion of this course students will be able to:
1. Identify and describe plant structural defenses.
2. Perform SRID and rocket IEP techniques accurately.
3. Isolate and count spleen cells using standard procedures.
4. Determine blood groups and Rh factor with precision.
5. Conduct immunological assays and analyze results effectively.

PRACTICAL SYLLABUS
1. Survey of structural plants defences: viz. cuticle, wax, lignin, bark, thorns, prickles, trichomes.
2. Immunodiffusion – SRID. Rocket IEP
3. Spleen cell isolation and counting.
4. ABO and Rh blood grouping
5. Latex agglutination assay
6. Quantitative immunoprecipitation assay

RECOMMENDED BOOKS
1. Gowenlock, A.H. and Donald, J(2002). Varley's practical clinical Biochemistry, sixth edition, CBS publications and Distributors, New Delhi.
2. Sembulingam, K and Sembulingam, P(2010). Essentials of Medical Physiology, fifth edition. Jaypae Brothers (p) ltd, New Delhi.
3. Burtis and Ashwood (2007) Tietz Fundamentals of Clinical chemistry, 6th edition, WB Saunders Company, Oxford Science Publications USA.
4. Chatterjee and Shindae(2012). Text book of medical biochemistry, 8th edition.
5. Devlin, T.M(2010). Text Book of Biochemistry with clinical correlations, 7th edition. NewYork.
6. Gans, G and Murphy, J.M. (2008). Clinical Biochemistry, fourth edition, Churchill Livingstone, Elsevier

St. JOSEPH'S COLLEGE FOR WOMEN (AUTONOMOUS), VISAKHAPATNAM
w.e.f. AY 2023-24
IV Semester
CLINICAL BIOCHEMISTRY

Code- BCH Ma2 4801 (3)
Credits: 3 Hours/Week: 3

Course Objectives: By the end of this course the learner can:
1. Learn basic equipment in a Clinical Biochemistry laboratory
2. Acquire knowledge on Haemoglobin related disorders
3. Understand fundamental of Renal and Gastric functioning
4. Learn basic tests used to analyse pancreas and liver
5. Imbibe knowledge on clinically importance enzymes

Course Outcomes: On completion of this course students will be able to:
1. Illustrate and establish a Clinical Biochemistry laboratory that is automated
2. Narrate the reasons behind the hemoglobinopathies and anaemias
3. Explain reasons for renal and gastric failure and analyse the test
4. Illustrate functions of liver and its related disorders
5. Explain role of enzymes in clinical diagnostics

UNIT-I
1. Introduction to Clinical Biochemistry Laboratory
1.1 Clinical Biochemistry Laboratory and Investigation of Homeostasis.
1.2 The use of biochemical tests.
1.3 Specimen collection and types, Automation and Computerization
1.4 Water and electrolyte homeostasis - renin angiotensin – aldosterone system
1.5 Pathological variations of water and electrolytes- diagnosis and Interpretations

Self-Study: Acid base balance and imbalance - Mechanism of regulations, Anion gap, Acidosis and Alkalosis.

UNIT-II
2. Abnormal Hemoglobin and Inherited Disorders
2.1 Inborn errors of Metabolism: Patterns of inheritance - alkaptonuria, phenyl ketonuria, albinism, glycogen storage diseases
2.2 Inherited disorders associated with urea cycle.
2.3 Abnormal hemoglobin and' hemoglobinopathies- Sickle cell anemia and thalassemias, porphyrias and porphyrinurias.

Self-study: Plasma proteins in health and diseases

UNIT-III
3. Investigation of Renal and Gastric functions
Renal functions tests:

3.1 Preliminary investigations, tests based on GFR, RPF and tubular function.
3.2 Diseases related to kidney - nephritis, nephrosis, uremia, renal failure, renal calculi, renal hypertension, renal tubular acidosis, diabetes insipidus.

Dialysis - haemodialysis and peritoneal dialysis.

Gastric function tests:
3.3 Examination of resting content, Fractional gastric analysis, stimulation tests, Tubeless gastric analysis.
3.4 Malabsorption syndrome, acidity, ulcers - gastric, duodenal and peptic, colon cancer, pancreatitis, gastric and pancreatic 'function tests.

Self study: Gout, Leschnyhan syndrome and oroticaciduria.

UNIT-IV
4. Liver Function Tests and Lipid Disorder Liver function tests:
4.1 Tests based on abnormalities of bile pigment metabolism, detoxification and excretory functions.
4.2 Diagnosis of different types of jaundice.
4.3 Pancreatic function tests.
4.4 Diseases relating to liver - jaundice, cirrhosis, hepatitis, cholestasis, cholelithiasis, hepatic coma, hepatic carcinoma
4.5 Inherited diseases of bilirubin metabolism
4.6 Lipid: Lipoprotinemias and atherosclerosis coronary heart diseases and hypertension.

Self study: Biochemical changes in cancer - detection of tumor markers

UNIT- V
5. Blood Glucose, Regulation and Enzymes of Diagnostic Importance
Carbohydrates:
5.1 Blood glucose level - regulation and its clinical significance, Diabetes mellitus, Glycosuria and GTT.

Enzymes and Isoenzymes of clinical importance
5.2 General principles of assay - Clinical significance of enzymes and isoenzymes (LDH, CK, phosphatase, 5' nucleosidase, amylase, lipase, acetyl cholinesterase, transaminase and gamma glutamyl transferase)

Self study: meningitis, encephalities, epilepsy, Parkinson's, Alzheimer's, cerebral palsy.

RECOMMENDED BOOKS
1. Gowenlock, A.H. and Donald, J(2002). Varley's practical clinical Biochemistry, sixth edition, CBS publications and Distributors, New Delhi.
2. Sembulingam, K and Sembulingam, P(2010). Essentials of Medical Physiology, fifth edition. Jaypae Brothers (p) ltd, New Delhi.

3. Burtis and Ashwood (2007) Tietz Fundamentals of Clinical chemistry, 6th edition, WB Saunders Company, Oxford Science Publications USA.
4. Chatterjee and Shindae(2012). Text book of medical biochemistry, 8th edition.
5. Devlin, T.M(2010). Text Book of Biochemistry with clinical correlations, 7th edition. NewYork.
6. Gans, G and Murphy, J.M. (2008). Clinical Biochemistry, fourth edition, Churchill Livingstone, Elsevier

St. JOSEPH'S COLLEGE FOR WOMEN (AUTONOMOUS), VISAKHAPATNAM
w.e.f. AY 2023-24
IV Semester
CLINICAL BIOCHEMISTRY PRACTICALS

Code- BCH Ma2 4851 (1)

Credits: 1 Hours/Week: 2

Course Objectives: By the end of this course the learner can:

1. Learn analysis of blood glucose, iron and Hb.
2. Acquire knowledge serum and urine analysis for some minerals
3. Imbibe knowledge on lipid profiling
4. Learn protocols for liver function tests
5. Perform protocols for kidney function tests

Course Outcomes: On completion of this course students will be able to:

1. Analyse serum for Glucose, Iron, Hb and GTT.
2. Estimate biologically important compounds and ions like creatinine and chloride in serum and urine
3. Analyse the serum for lipids like cholesterol, HDL and LDL.
4. Examine bilirubin, albumin, globulin and some enzymes for estimating liver function
5. Analyse urea, creatinine and uric acid to evaluate kidney functioning.

PRACTICAL SYLLABUS

1. Blood analysis: Iron and Hemoglobin, Glucose, GTT.
2. Serum and Urine analysis: Creatine, chloride, phosphorus, calcium.
3. Lipid profiles (Serum) – Total cholesterol, triglycerides, HDL, LDL
4. Liver function tests – Total Bilirubin, total protein, albumin, globulin, albumin/globulin ratio, AST, ALT, ALP
5. Kidney function tests Urea, creatinine, uric acid.

RECOMMENDED BOOKS

1. Gowenlock, A.H. and Donald, J(2002). Varley's practical clinical Biochemistry, sixth edition, CBS publications and Distributors, New Delhi.
2. Sembulingam, K and Sembulingam, P(2010). Essentials of Medical Physiology, fifth edition. Jaypae Brothers (p) ltd, New Delhi.
3. Burtis and Ashwood (2007) Tietz Fundamentals of Clinical chemistry, 6th edition, WB Saunders Company, Oxford Science Publications USA.
4. Chatterjee and Shindae(2012). Text book of medical biochemistry, 8th edition.
5. Devlin, T.M(2010). Text Book of Biochemistry with clinical correlations, 7th edition. NewYork.
6. Gans, G and Murphy, J.M. (2008). Clinical Biochemistry, fourth edition, Churchill Livingstone, Elsevier

St. JOSEPH'S COLLEGE FOR WOMEN (AUTONOMOUS), VISAKHAPATNAM
w.e.f. AY 2023-24
IV Semester
Course No-3: BIOENERGETICS AND METABOLISM OF CARBOHYDRATES AND LIPIDS

Credits: 1 Hours/Week: 3

Course Objectives: By the end of this course the learner can:
1. Learn protocol for isolation of casein and lactalbumin from milk
2. Acquire knowledge on estimation of glucose
3. Estimate urea and creatinine in serum
4. Learn protocol estimation of cholesterol
5. Perform protocol for estimation of glucose

Course Outcomes: On completion of this course students will be able to:
1. Isolate casein and lactalbumin from milk
2. Estimate reducing sugars in food samples and urine
3. Analyse glucose in urine using titrimetric method
4. Estimate serum for urea and creatine
5. Analyse serum cholesterol

PRACTICAL SYLLABUS
1. Isolation of casein from milk
2. Preparation of lactalbumin from milk
3. Estimation of reducing sugar by DNS (dinitrosalicylic acid) method
4. Titration of glucose by Benedict's method
5. Estimation of urea by Diacetylmonoxime method
6. Estimation of creatinine in serum
7. Estimation of cholesterol by ZAK's method

RECOMMENDED BOOKS
1. Principles of Biochemistry, White. A, Handler, P and Smith.
2. Biochemistry, Lehninger A.L.
3. Biochemistry, David E. Metzler.
4. Biochemistry, LubertStryer.
5. Text of Biochemistry, West and Todd.

St. JOSEPH'S COLLEGE FOR WOMEN (AUTONOMOUS), VISAKHAPATNAM

w.e.f. AY 2023-24
IV Semester
Course No-4: CLINICAL BIOCHEMISTRY

Credits: 3 Hours/Week: 3

Course Objectives: By the end of this course the learner can:

1. Learn basic equipment in a Clinical Biochemistry laboratory
2. Acquire knowledge on Haemoglobin related disorders
3. Understand fundamental of Renal and Gastric functioning
4. Learn basic tests used to analyse pancreas and liver
5. Imbibe knowledge on clinically importance enzymes

Course Outcomes: On completion of this course students will be able to:

1. Illustrate and establish a Clinical Biochemistry laboratory that is automated
2. Narrate the reasons behind the hemoglobinopathies and anaemias
3. Explain reasons for renal and gastric failure and analyse the test
4. Illustrate functions of liver and its related disorders
5. Explain role of enzymes in clinical diagnostics

UNIT-I Introduction to Clinical Biochemistry Laboratory

Clinical Biochemistry Laboratory and Investigation of Homeostasis. The use of biochemical tests- Specimen collection and types, Automation and Computerization Water and electrolyte homeostasis - renin angiotensin – aldosterone system Pathological variations of water and electrolytes- diagnosis and Interpretations Self Study: Acid base balance and imbalance - Mechanism of regulations, Anion gap, Acidosis and Alkalosis.

UNIT-II Abnormal Hemoglobin and Inherited Disorders

Inborn errors of Metabolism: Patterns of inheritance - alkaptonuria, phenyl ketonuria, albinism, glycogen storage diseases and inherited disorders associated with urea cycle. Abnormal hemoglobin and' hemoglobinopathies- Sickle cell anemia and thalassemias, porphyrias and porphyrinurias.

Self-study: Plasma proteins in health and diseases

UNIT-III Investigation of Renal and Gastric functions

Renal functions tests: Preliminary investigations, tests based on GFR, RPF and tubular function. Diseases related to kidney - nephritis, nephrosis, uremia, renal failure, renal calculi, renal hypertension, renal tubular acidosis, diabetes insipidus.. Dialysis - hemodialyis and peritoneal dialysis.

Gastric function tests: Examination of resting content, Fractional gastric analysis, stimulation tests, Tubeless gastric analysis. Malabsorption syndrome, acidity, ulcers - gastric, duodenal and peptic, colon cancer, pancreatitis, gastric and pancreatic 'function tests. Self study: Gout, Leschnyhan syndrome and oroticaciduria.

UNIT-IV Liver Function Tests and Lipid Disorder Liver function tests:

Tests based on abnormalities of bile pigment metabolism, detoxification and excretory functions. Diagnosis of different types of jaundice.

Pancreatic function tests.
Diseases relating to liver - jaundice, cirrhosis, hepatitis, cholestasis, cholelithiasis, hepatic coma, hepatic carcinoma, inherited diseases of bilirubin metabolism **Lipid:** Lipoprotinemias and atherosclerosis coronary heart diseases and hypertension.
Self study: Biochemical changes in cancer - detection of tumor markers

UNIT- V Blood Glucose Regulation and Enzymes of Diagnostic Importance
Carbohydrates: Blood glucose level - regulation and its clinical significance, Diabetes mellitus, Glycosuria and GTT.
Enzymes and Isoenzymes of clinical importance - general principles of assay - Clinical significance of enzymes and isoenzymes (LDH, CK, phosphatase, 5' nucleosidase, amylase, lipase, acetyl cholinesterase, transaminase and gamma glutamyl transferase)
Self study: meningitis, encephalities, epilepsy, Parkinson's, Alzheimer's, cerebral palsy.

RECOMMENDED BOOKS
1. Gowenlock, A.H. and Donald, J(2002). Varley's practical clinical Biochemistry, sixth edition, CBS publications and Distributors, New Delhi.
2. Sembulingam, K and Sembulingam, P(2010). Essentials of Medical Physiology, fifth edition. Jaypae Brothers (p) ltd, New Delhi.
3. Burtis and Ashwood (2007) Tietz Fundamentals of Clinical chemistry, 6th edition, WB Saunders Company, Oxford Science Publications USA.
4. Chatterjee and Shindae(2012). Text book of medical biochemistry, 8th edition.
5. Devlin, T.M(2010). Text Book of Biochemistry with clinical correlations, 7th edition. NewYork.
6. Gans, G and Murphy, J.M. (2008). Clinical Biochemistry, fourth edition, Churchill Livingstone, Elsevier

St. JOSEPH'S COLLEGE FOR WOMEN (AUTONOMOUS), VISAKHAPATNAM
w.e.f. AY 2023-24
IV Semester
Course No-4: CLINICAL BIOCHEMISTRY

Credits: 2 Hours/Week: 3

Course Objectives: By the end of this course the learner can:

1. Learn analysis of blood glucose, iron and Hb.
2. Acquire knowledge serum and urine analysis for some minerals
3. Imbibe knowledge on lipid profiling
4. Learn protocols for liver function tests
5. Perform protocols for kidney function tests

Course Outcomes: On completion of this course students will be able to:

1. Analyse serum for Glucose, Iron, Hb and GTT.
2. Estimate biologically important compounds and ions like creatinine and chloride in serum and urine
3. Analyse the serum for lipids like cholesterol, HDL and LDL.
4. Examine bilirubin, albumin, globulin and some enzymes for estimating liver function
5. Analyse urea, creatinine and uric acid to evaluate kidney functioning.

PRACTICAL SYLLABUS

1. Blood analysis: Iron and Hemoglobin, Glucose, GTT.
2. Serum and Urine analysis: Creatine, chloride, phosphorus, calcium.
3. Lipid profiles (Serum) – Total cholesterol, triglycerides, HDL, LDL
4. Liver function tests – Total Bilirubin, total protein, albumin, globulin, albumin/globulin ratio, AST, ALT, ALP
5. Kidney function tests Urea, creatinine, uric acid.

RECOMMENDED BOOKS

1. Gowenlock, A.H. and Donald, J(2002). Varley's practical clinical Biochemistry, sixth edition, CBS publications and Distributors, New Delhi.
2. Sembulingam, K and Sembulingam, P(2010). Essentials of Medical Physiology, fifth edition. Jaypae Brothers (p) ltd, New Delhi.
3. Burtis and Ashwood (2007) Tietz Fundamentals of Clinical chemistry, 6th edition, WB Saunders Company, Oxford Science Publications USA.
4. Chatterjee and Shindae(2012). Text book of medical biochemistry, 8th edition.
5. Devlin, T.M(2010). Text Book of Biochemistry with clinical correlations, 7th edition. NewYork.
6. Gans, G and Murphy, J.M. (2008). Clinical Biochemistry, fourth edition, Churchill Livingstone, Elsevier

St. JOSEPH'S COLLEGE FOR WOMEN (AUTONOMOUS), VISAKHAPATNAM
w.e.f. AY 2025-26
V Semester
NUTRITIONAL BIOCHEMISTRY

Code- BCH Mi1 5801 (3)
Credits: 3 Hours/Week: 3

Course Objectives: By the end of this course the learner can:
1. Narrate the nutrients of animal and plant food and learn about calorific value
2. Explain about role of diet and nutrition in body mass balance and special nutrition requirements
3. Describe the biological impact of Antinutrients, toxins, food allergens.
4. Illustrate the role of vitamins and minerals
5. Explain the diet management in some disease states

Course Outcomes: On completion of this course students will be able to:
1. To compile various Nutrition and balanced diet, various dietary requirements of nutrients.
2. To acquire knowledge about protein calorie malnutrition
3. To learn the biological impact of antinutrients, toxins and food allergens
4. To revise the facts about Fat- and Water-soluble vitamins and their importance
5. To learn about dietary management in diseases

UNIT- I
1. Composition of Foods and BMR
1.1 Animal and vegetative foods – chemical composition.
1.2 Nutrients – Essential Nutrients and their classification.
1.3 Digestibility, absorption and biochemical functions of macro nutrients.
1.4 Carbohydrates – dietary requirements.
1.5 Proteins – Nitrogen balance studies,
1.6 Determination of Biological values of proteins,
1.7 Specific Dynamic Action
1.8 Improvement of protein quality by supplementation and fortification.
1.9 Lipids – Dietary needs of lipids, essential fatty acids.
1.10 Calorific values of foods
1.11 Basal metabolic rate and its determination, factors influencing BMR.

UNIT-II
2. Clinical nutrition and nutritional requirements
2.1 Clinical nutrition – role of diet and nutrition in prevention of atherosclerosis and obesity
2.2 Role of leptin in regulation of body mass.
2.3 Starvation – Protein sparing treatment during fasting
2.4 Protein calorie malnutrition – Kwashiorkar and Marasmus
2.5 Nutritional requirements for pregnant and lactating women and aged people.

UNIT-III
3. Antinutrients, Toxins and Food allergens

3.1 Biological effects of non-nutrients, dietary fibre, physiological actions.
3.2 Antinutrients – Protease inhibitors, hemagglutinins, hepatotoxin, goitrogens, cyanogenic glucosides, methyl xanthines, oxalates.
3.3 Toxins from mushrooms.
3.4 Biological effects of food contaminants – Hexachlorobenzene, arsenic, DDT, cadmium, mercury, lead, aflatoxins,
3.5 Food additives - saccharin and sodium nitrite.
3.6 Food allergy – types of food allergens and management of food allergy.
3.7 Food processing and loss of nutrients during processing and cooking.

UNIT-IV

4. Vitamins and minerals

4.1 Vitamins – Fat soluble vitamins (A,D,E,K) - Sources, biological functions and RDA
4.2 Water soluble vitamins (B complex and C) - Sources, biological functions and RDA
4.3 Disorders of vitamins A, D, E, K , C and B
4.4 Minerals- iron, calcium, iodine, selenium - Sources, biological functions and RDA.
4.5 Deficiency disorders of minerals
4.6 Nutritional requirements in infancy, childhood, pregnancy and lactation and old age.

UNIT- V

5. Dietary Management in diseases

5.1 Obesity – Causes, Anthropometric measurements and Diet management.
5.2 Dietary management in – Infection, Fever, Constipation, Diabetes mellitus, Peptic Ulcer, PCOS, Hypertension, Cardiovascular diseases, Pancreatitis, Cirrhosis and Cancer.

RECOMMENDED BOOKS

1. Smith EL (1983) Principles of biochemistry: mammalian biochemistry: McGraw- Hill Companies.
2. Chatterjee CC (1951) Human physiology: Medical Allied Agency.
3. Murray R, Granner D, Mayes P, Rodwell V (2003) Harper's illustrated biochemistry (LANGE basic science): McGraw-Hill Medical.
4. Guyton Aurcher C, Hall John E (2006) Text book of Medical Physiology. Elsevier India Pvt. Ltd. New Delhi.
5. Dixon M, Webb E (1979) Enzyme inhibition and activation. Enzymes 3: 126-136.
6. Rao C (1973) University General Chemistry: An Introduction to Chemical Science: MacMillan India.
7. Price NC, Frey PA (2001) Fundamentals of enzymology. Biochemistry and Molecular Biology Education 29: 34-35.
8. Palmer T, Bonner PL (2007) Enzymes: biochemistry, biotechnology, clinical chemistry: Elsevier

St. JOSEPH'S COLLEGE FOR WOMEN (AUTONOMOUS), VISAKHAPATNAM
w.e.f. AY 2025-26
V Semester
NUTRITIONAL BIOCHEMISTRY PRACTICALS

Code- BCH Mi1 5851 (1)

Credits: 1 Hours/Week: 2

Course Objectives: By the end of this course the learner can:

1. Determine Vitamin C concentration in food samples
2. Analyse the ash content of food samples
3. Demonstrate analysis of quality of milk
4. Determine moisture content of food samples
5. Perform protocols for quality testing of oils

Course Outcomes: On completion of this course students will be able to:

1. Analyse the role of various vitamins and minerals
2. Determine composition of milk
3. Determine ask content in food
4. Analyse quality of oil
5. Determine moisture content of foods

PRACTICAL SYLLABUS

1. Determination of reduced Ascorbic acid by DCPIP method
2. Determination of total Ascorbic acid by DNPH method
3. Determination of calcium in the food
4. Isolation of casein from milk and determination of its protein by any method
5. Determination of cholesterol of edible oil
6. Determination of ash content
7. Determination of moisture content of foods/food grains/ powders
8. Determination of fructose from honey/fruit pulp
9. Determination of pyridoxine of fruits/leaves
10. Isolation of lactose from skimmed milk and the estimation of lactose
11. Determination of iodine value of edible oil by titrimetry
12. Determination of acid value by titrimetry

RECOMMENDED BOOKS

1. Murray R, Granner D, Mayes P, Rodwell V (2003) Harper's illustrated biochemistry (LANGE basic science): McGraw-Hill Medical.
2. Guyton Aurcher C, Hall John E (2006) Text book of Medical Physiology. Elsevier India Pvt. Ltd. New Delhi.
5. Dixon M, Webb E (1979) Enzyme inhibition and activation. Enzymes 3: 126-136.
6. Rao C (1973) University General Chemistry: An Introduction to Chemical Science: MacMillan India.
7. Price NC, Frey PA (2001) Fundamentals of enzymology. Biochemistry andMolecular Biology Education 29: 34-35.
8. Palmer T, Bonner PL (2007) Enzymes: biochemistry, biotechnology, clinical chemistry: Elsevier

St. JOSEPH'S COLLEGE FOR WOMEN (AUTONOMOUS), VISAKHAPATNAM
w.e.f. AY 2025-26
V Semester
ENZYMOLOGY

Code- BCH Mi2 5801 (3)
Credits: 3 Hours/Week: 3

Course Objectives: By the end of this course the learner can:
1. Identify the class of enzymes, name them and narrate its working
2. Explain the kinetics of enzyme activity and study factors that contribute to it
3. Measure enzyme activity and study impact of inhibitors
4. Illustrate the method of regulation of enzyme activity
5. Use enzymes at industrial scale

Course Outcomes: On completion of this course students will be able to:
1. Classify enzymes and narrate their interaction with substrate
2. Determine Vmax and Km value of enzymes
3. Explain about enzyme inhibitions and measure enzyme activity
4. Understand enzyme regulation
5. Narrate enzyme immobilization and their uses.

UNIT-I
Introduction to Enzymes and Nomenclature
1.1 Introduction to enzymes: Holoenzyme, apoenzyme, prosthetic group.
1.2 Interaction between enzyme and substrate- lock and key model, induced fit model., enzyme specificity and types.
1.3 IUB system of classification and nomenclature of enzymes (Class and subclass with one example)
1.4 Ribozymes, Abzymes

UNIT-II
2. Enzyme kinetics
2.1 Enzyme kinetics: Importance, order of reaction
2.2 Study of the factors affecting the velocity of enzyme catalysed reaction- enzyme concentration, temperature, pH, substrate concentration, inhibitors
2.3 Derivation of Michaelis -Menten equation and Km value determination and its significance.
2.4 Definition of Vmax value of enzyme and its significance.
2.5 Lineweaver- Burk plot (Only for single substrate enzyme catalyzed reaction).

UNIT-III
3. Measurement of Enzyme activity, units and inhibitors
3.1 Methods of measurements and expression of enzyme activity.
3.2 Unit of enzyme activity - definition and importance.
3.3 Enzyme inhibition: Reversible and irreversible – examples. Reversible- competitive, noncompetitive and uncompetitive inhibition
3.4 Explanation of double reciprocal plot with examples.

UNIT-IV

4 Regulation of Enzymes

4.1 Enzyme regulation – covalently modulated enzymes with examples of adenylation and phosphorylation and allosteric regulation- example Aspartate trascarbamoylase.

4.2 Isoenzymes- Lactate dehydrogenase and creatine phosphokinase.

4.3 Zymogens

UNIT-V

5. Enzyme immobilization and applications

5.1 Immobilization of enzymes, methods of immobilization.

5.2 Industrial uses of enzymes: Detergent enzymes, thermostable alpha amylase, papain, chymotrypsin

RECOMMENDED BOOKS

1. Enzymes: M. Dixon and E. C. Webb. Longman Publication
2. Enzymology: Nicholas and Price
3. Biochemistry: D.Voet and J. G. Voet, John Wiley & sons Inc. New York, Chischester Brisbane, Toronto, Singapore ISBN 0-471-58651-X
4. Biochemistry: L. Stryer. and Hall, J.E., Library of congress cataloguing-in publication Data, Bery, Jeremy mark ISBN -0-7167-4684-0.
5. Enzymes: Trevor Palmer Affiliated East- West Press Pvt. Ltd, New Delhi ISBN 817671-04

St. JOSEPH'S COLLEGE FOR WOMEN (AUTONOMOUS), VISAKHAPATNAM
w.e.f. AY 2025-26
V Semester
ENZYMOLOGY PRACTICALS

Code- BCH Mi2 5851 (1)

Credits: 1 Hours/Week: 2

Course Objectives: By the end of this course the learner can:

1. Acquire the knowledge determining alpha amylase activity
2. Identify the effect of pH on enzyme activity
3. Study the determination of optimum values for physical factors
4. Explain monosubstrate and bisubstrate reaction kinetics.
5. Explore the applications of enzymes in clinical and various industrial sectors.

Course Outcomes: On completion of this course students will be able to:

1. Assay enzymes given
2. Determine the optimum pH and temperature for enzymes
3. Analyse the effect of substrate concentration on enzymes
4. Explain and demonstrate enzyme kinetics
5. Perform and evaluate mono-substrate and bi-substrate kinetics

PRACTICAL SYLLABUS

1. Assay of α- amylase activity in saliva
2. Determination of optimum pH of a plant/animal or microbial enzyme.
3. Studying the effect of different temperatures during enzyme activity measurements.
4. Studying the effect of different pH during enzyme activity measurements.
5. Substrate saturation and determination of Km value from Michaelis Menten curve.

RECOMMENDED BOOKS

1. Biochemistry: L. Stryer. and Hall, J.E., Library of congress cataloguing-in publication Data, Bery, Jeremy mark ISBN -0-7167-4684-0.
2. Enzymes: Trevor Palmer Affiliated East- West Press Pvt. Ltd, New Delhi ISBN 817671-04