

St. JOSEPH'S COLLEGE FOR WOMEN (AUTONOMOUS), VISAKHAPATNAM
I SEMESTER **BIOCHEMISTRY** Time:4Hrs/Wk
BCH 1801 **HUMAN PHYSIOLOGY** Marks:100
w.e.f. 2019-2020 (19AG) **SYLLABUS**

OBJECTIVES: To enable students to:-

- Correlate functional relationships between organ systems and understand homeostatic mechanisms.
- Describe the distribution and composition of body fluids.
- Classify people based on Blood groups.
- Illustrate Blood coagulation mechanism.
- Elucidate transfer of action potential in nerves and muscles.

Course outcomes: Students will be able to

CO1: Gain enhanced knowledge on the normal functions of all the organ systems

CO2: Recognize the relative contribution of each organ system in the maintenance of the milieu of interior (homeostasis).

CO3: Correlate knowledge of physiology of human cardiovascular system, digestive system and excretory system to physiological responses

CO4: Explain the physiology of Nervous system, respiration and excretion

CO5: Illustrate integration of human systems

COURSE:

UNIT-I : CARDIOVASCULAR AND LYMPHATIC SYSTEM: Blood components and their function, genesis of Erythrocytes. Resistance of the body to infection: blood groups: the ABO system, the rhesus system, blood clotting factors, intrinsic and extrinsic pathways for blood clotting; composition and functions of lymph and lymphatic system :overall design of circulatory system; pulmonary and systemic circulation.

UNIT-II: RESPIRATORY SYSTEM: Components of respiratory system (nasal cavity, trachea, pharynx, Larynx, lungs, bronchi, bronchioles and alveoli) and their functions; Physiology of respiration : Diffusion of oxygen and CO₂; transport of oxygen; role of hemoglobin, dissociation curve of oxyhemoglobin and its significance, Bohr's effect; transport of CO₂ and chloride shift; Various buffer system of the blood; Acid-base balance, factors affecting acid-base balance, acidosis and alkalosis, role of lung in regulation of acid-base balance.

UNIT-III: EXCRETORY SYSTEM: Kidney: Structure and its organization. Functions of glomerular membrane and glomerular filtration rate (GFR). Structural and functional characteristics of tubules, selective reabsorption and secretion, role of aldosterone and antidiuretic hormones and mechanism of urine formation.

UNIT-IV: DIGESTIVE SYSTEM AND NERVOUS SYSTEM: Digestion and absorption of carbohydrates, lipids and proteins, role of various enzymes of HCl formation in stomach. Introduction to gastrointestinal hormones. Types of muscles & skeletal muscle contraction

Organization of the system: Nerve cells, Nerve fibers, Nerve impulses. Neurotransmission Synapses: Chemical and Electrical synapses, functional properties of nerve fiber, action potential, the reflex action and reflex arc

UNIT-V: ENDOCRINE SYSTEM: A brief outline of various endocrine glands (Thyroid gland, Pancreatic gland, Adrenal gland, Testis, Ovary) and their physiological roles, feed-back regulation of hormone secretion. Hormone receptors and their activation.

REFERENCES:

1. Best and Taylor (1969), The Living Body, Chapman and Hall, Madras.
2. Oser, B.L. (1961) Hawk's Physiological Chemistry, Tata MC Graw Hill Book Co. Bombay.

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OBJECTIVES: To enable students to –

- Identify characteristic features of various tissues by observing the mounted slides
- Implement the gained knowledge in identifying unknown tissue specimens
- Develop skills to assess biological parameter- temperature, Blood pressure, arterial pulse rate etc.
- Well versed in determining blood grouping and percentage of Hemoglobin
- Gain expertise in basics of enzyme assay

Course Outcomes: The students will be able to

CO1: Trained in handling microscopes and observe biological specimens

CO2: Gain knowledge on identification features of various tissues of human body

CO3: Determine blood pressure, arterial pulse rate and record body temperature

CO4: Students get well versed in blood group determination which is required in blood banks and medical labs

CO5: Carry out qualitative tests of Saliva

COURSE:

UNIT - I: Detailed study of various tissues – identification of slides.

UNIT - II: Blood cells – freshly mounted and stained.

UNIT - III: Determination of blood groups.

UNIT - IV: Determination of Hemoglobin in blood.

UNIT - V: Recording temperature, pulse rate and measurement of blood pressure
– effect of exercise.

UNIT - VI: Qualitative tests with saliva.

REFERENCES:

1. Best and Taylor (1969), The Living Body, Chapman and Hall, Madras.
2. Pearce E. (1979), Anatomy and Physiology for Nurses, Oxford University Press, Madras.
3. Subrahmaniam S and Kutty M (1979) Text book of Physiology, Orient Longman, Chennai.
4. Animal Physiology by A.K.Berry (Text Book).
5. Langley L.C. (1971).Outline of Physiology; Mac Graw Hill Co., New York.
6. Mc Naught & Calendar E (1970).Illustrated Physiology. W &S.Livingstone ; London

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St. JOSEPH'S COLLEGE FOR WOMEN (AUTONOMOUS), VISAKHAPATNAM
II SEMESTER **BIOCHEMISTRY** TIME:4Hrs/Week
BCH 2801 **BIOMOLECULES – I** Max.Marks:100
w.e.f. 2019-2020 (19AG)

OBJECTIVES : To enable the students to-

- Use various solvents, prepare different types of buffers based on need
- Identify and classify carbohydrates based upon their properties.
- Learn and interpret the various polysaccharides and mucopolysaccharides of nature
- Identify lipids and understand their physiological role
- Illustrate ways to analyze quality of lipids and appreciate their biological significance.

Course Outcomes- Students will be able to

CO1: Correlate the Physico -Chemical properties of Biomolecules to their structures

CO2: Compare and contrast the structure and functions of oligosaccharides and polysaccharides

CO3: Identify and establish the functional groups of Biomolecules such as Carbohydrates and Lipids

CO4: Differentiate between saturated, monounsaturated, polyunsaturated fatty acids.

CO5: Classify lipids and Illustrate their biological role

COURSE :

UNIT-I : INTRODUCTION : Introduction to Biochemistry, Water as a biological solvent, weak acids and bases, p^H , buffers, Henderson-Hasselbalch equation, physiological buffers, fitness of the aqueous environment for living organisms.

UNIT-II : CARBOHYDRATES : Structure of monosaccharide. Stereo isomerism and optical isomerism of sugars, Reactions of aldehyde and ketone groups. Ring structure and anomeric forms, mutarotations. Reactions of sugars due to hydroxyl groups. Biological importance of monosaccharides Important derivatives of monosaccharides-structure, occurrence and functions of important ones).

UNIT-III: CARBOHYDRATES : Structure occurrence and biological importance of monosaccharides, oligosaccharides and polysaccharides E.g.:Cellulose, chitin, agar, alginic acids, pectin, proteoglycans, sialic acids, blood group polysaccharides, glycogen and starch. Bacterial cell wall polysaccharide eg. Peptidoglycan, Glycoproteins. mucopolysaccharides & trisaccharides- Raffinose, melezitose.

UNIT-IV: LIPIDS: Definition and classification. Fatty acids: introduction, classification, nomenclature, structure and properties of saturated and unsaturated fatty acids. Essential fatty acids, prostaglandins, Lipoproteins. Bio – membranes structure and transport of ions & molecules.

UNIT-V : TRIACYLGLYCEROLS: nomenclature, physical properties, chemical properties and characterization of fats – hydrolysis, saponification value, rancidity of fats, Reichert-Meissel number and reaction of glycerol. Biological significance of fats. Glycerophospholipids (lecithins, lysolecithin, cephalin, phosphatidyl serine, phosphatidyl inositol, plasmalogens), sphingomyelins, glycolipids – cerebrosides, gangliosides . Properties and functions of phospholipids, isoprenoids and sterols.

REFERENCES :

1. Rama Rao, A.V.S.S. (1989) Text Book of Biochemistry, L.K.& S Publishers, Visakhapatnam.
2. Conn, E.E. and Stump, P.K. (1989) Outline of Biochemistry. Wiley Eastern Ltd., New Delhi.
3. Keiner, I.S. and Orten, J.M. (1979) Biochemistry. C.V.Mosby&Co., St. Louis.
4. Sivaminathan, M(1981) Biochemistry For Medical Students, Geeta Book House Publishers, Mysore.
5. Kuchel.P.W. and Ralston, G.B. (1988) Theory and Problems Of Biochemistry, Mc Graw Hill Book Co., New York.
6. Berry A.K. (1989). Elementary Biochemistry, Emkay Publishers, New Delhi.

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St. JOSEPH'S COLLEGE FOR WOMEN (AUTONOMOUS) , VISAKHAPATNAM
II SEMESTER **BIOCHEMISTRY** TIME:3Hrs/Week
BCH 2851 **Qualitative and Quantitative analysis to Biomolecules-I** Max.Marks:50
w.e.f. 2019-2020 (19AG) **PRACTICALS – I B** **45 hours**

OBJECTIVES : To enable students to

- Prepare and use buffers to suit needs
- Analyze biomolecules - qualitative and quantitative techniques
- Interpret the data and draw logical conclusions
- Isolate and purify biomolecules using simplest of the procedures
- Separate biomolecules using chromatographic techniques

Course Outcomes- Students will be able to

CO1: Able to Interpret Experimental / Investigative data

CO2: Isolate and characterize carbohydrates and lipids

CO3: Apply estimation techniques to analyze quality of lipids

CO4: Separate carbohydrate mixtures and identify unknown ones

CO5: Extract lipids from suitable sources

COURSE :

1. Preparation of standard buffers and determination of p^H of a solution.
2. Qualitative tests for :
 - a. Carbohydrates
 - b. Lipids
3. Determination of saponification value and iodine number of fats.
4. Extraction of total lipids by Folch method
5. Isolation of cholesterol from egg yolk .
6. Estimation of carbohydrates by anthrone method.
7. Isolation of glycogen from sheep liver.
8. Isolation of starch from potatoes.
9. Separation of sugars using paper chromatography.

REFERENCES :

1. Plummer, D.T.(1979) An Introduction to Practical Biochemistry, Tata MC Graw Hill Book Co., Bombay.
2. Oser, B.L. (1961) Hawk's Physiological Chemistry, Tata MC Graw Hill Book Co. Bombay.
3. Burtis, C.A & Ashwood, E.R (Eds) (V Edn) Tietz Fundamentals of Clinical Biochemistry. WBS aunders& Co. New York.

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OBJECTIVES : To enable students to :

- Identify and classify amino acids based upon their properties.
- Recognize the physical structure and biological importance of peptides and their synthesis.
- Learn and interpret the various organizations of protein structure
- Correlate knowledge on nucleic acids with their physiological role
- Analyze quality of porphyrins and appreciate their biological significance.

Course Outcomes- Student will be able to

CO1: Classify Proteins based on solubility, shape and behavior in solution with respect to salts

CO2: Describe and recognize amino acid structure, classification, physical and chemical properties

CO3: Explain the structure of peptide bond formation, and levels of protein structure.

CO4: Synthesize peptides and learn the protein sequencing method which has much importance in research field

CO5: State the central dogma of molecular biology; recognize the structure of nucleic acids compare and contrast -DNA and RNA

COURSE:

UNIT- I: AMINO ACIDS : Introduction, Amino acids : common structural features, stereo isomerism and RS system of designating optical isomers, physical and chemical properties, titration curve of amino acids . Essential amino acids.

UNIT - II: PEPTIDES: Structure of peptide bond, chemical synthesis of polypeptides – protection and deprotection of N-terminal, and C-terminal ends and functional groups in the side-chains, Merrifield solid-phase peptide synthesis. Determination of amino acid sequence of a polypeptide chain, specific chemical and enzymatic cleavage of a polypeptide chain and separation of peptides.

UNIT - III: PROTEIN: Introduction, classification based on solubility, shape, composition and functions. Protein Structure: levels of structure in protein architecture, primary structure of protein, secondary structure of proteins – helix and pleated sheets, tertiary structure of protein, forces stabilizing the tertiary structure and quaternary structure of proteins. Denaturation, renaturaiton of proteins. Behaviour of proteins in solution, salting in and salting out of proteins. Structure and biological functions of fibrous protein (keratins, collagen and elastin) , globular protein (hemoglobin, myoglobin), lipoproteins, metalloproteins, glycoproteins and nucleoproteins.

UNIT - IV: NUCLEIC ACIDS : Nature of genetic material; Composition of RNA and DNA , generalized structural plan of nucleic acids, nomenclature used in writing structure of nucleic acids, features of DNA double helix. Denaturation and annealing of DNA, structure and roles of different types of RNA. Types of DNA. Central dogma of molecular biology.

UNIT-V: PORPHYRINS: Porphyrin nucleus and classification of porphyrins. Important metalloporphyrins occurring in nature . Detection of porphyrin spectrophotometrically and by fluorescence. Bile pigments – chemical nature and their physiological significance.

REFERENCES:

- 1.Rama Rao, A.V.S.S. (1989) Text Book of Biochemistry, L.K.&S Publishers, Visakhapatnam .
- 2.Comn, E.E. and Stump, P.K. (1989) Outline of Biochemistry. Wiley Eastern Ltd., New Delhi.
- 3.Kleiner, I.S. and Orten, J.M. (1979) Biochemistry. C.V.Mosby & Co., St Louis.
- 4.Swaminathan, M (1981) Biochemistry For Medical Students, Geeta Book House Publishers, Mysore.
5. Kuchel, P.W. and Ralston, G.B.(1988) Theory And Problems Of Biochemistry, Mc Graw Hill Book Co., New York.

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OBJECTIVES: To enable the students to-

- Qualitatively and quantitatively analyze biomolecules
- Determine the concentrations of amino acids and proteins
- Determine pK value of amino acids and use it in proteins isolations
- Estimate Nucleic acids and quantify DNA and RNA in a given mixture
- Separate and identify amino acids in an unknown sample
- Isolate albumin from various protein sources

Course Outcomes- The students will be able to

CO1: Develop hands on experience in estimation of proteins which is required in medical lab diagnostics

CO2: Learn usage of scientific instrument - pH meter in establishing Isoelectric point of unknown proteins

CO3: Estimate nucleic acids and distinguish DNA and RNA in biological specimens like forensics sciences

CO4: Well versed with chromatographic separation techniques- paper chromatography

CO5: Fractionate and estimate proteins in food samples

COURSE:

1. Qualitative Examination of Proteins and Amino acids.
2. Estimation of proteins –
 - a. Kjeldahl determination
 - b. Biuret Assay
 - c. Folin – Lowry Method
3. Titration curve for amino acids and determination of pk value.
4. Estimation of amino acids by ninhydrin method.
5. Estimation of DNA by DPA method.
6. Estimation of RNA by Orcinol method.
7. Separation of amino acids using paper chromatography.
8. Isolation of albumins from egg white.

REFERENCES:

1. Plummer, D.T. (1979) **An Introduction to Practical Biochemistry**, Tata MC Graw Hill Book Co., Bombay.
2. Oser, B.L.(1961) **Hawk's Physiological Chemistry**, Tata MC Graw Hill Book Co. Bombay.
3. Burtis, C.A & Ashwood E.R(Eds) (V Edn) Tietz Fundamentals of Clinical Biochemistry . WBSaunders & Co. New York.

St. JOSEPH'S COLLEGE FOR WOMEN (AUTONOMOUS) , VISAKHAPATNAM
IV SEMESTER **BIOCHEMISTRY** TIME:4 Hrs/Week
BCH 4801 (3) **ENZYMOLGY** Max.Marks:100
w.e.f 2016-2019("16AD") **SYLLABUS**

OBJECTIVES: To enable the students to-

- Comprehend basic concepts of enzymology
- Evaluate enzyme kinetics and effects of inhibitors on rate of reaction
- Recognize the importance of cofactors in biocatalytic reactions
- Interpret and use enzyme purification techniques
- Apply the knowledge in Industries and Clinical processes

Course Outcomes- The students will be able to

- CO1:** Describe the chemical nature of enzymes and use appropriate nomenclature
CO2: Correlate enzyme kinetics to recognize Enzyme action and binding site significance
CO3: Realize the significance of cofactors in, both In vivo and In vitro processes
CO4: Purify enzyme from any given biological source
CO 5: Immobilize enzymes and recognize their importance in industrial to medical fields.

COURSE:

UNIT- I: INTRODUCTION - History, general characteristics, nomenclature, IUB enzyme classification (rationale, overview and specific examples) . Significance of numbering system. Definition with examples of holoenzyme, apoenzyme, coenzyme, cofactor, activator, inhibitors, active site (identification of groups excluded) metallo-enzymes, units of enzyme activity, isoenzymes, monomeric enzymes, oligomeric enzymes and multi-enzymes complexes . Enzyme specificity.

UNIT- II: ENZYME KINETICS – Factors affecting enzyme activity : enzyme concentration, substrate concentration, pH and temperature. Derivation of Michaelis – Menten equation for uni-substrate reactions. K_m and its significance. Line Weaver-Burk plot and its limitations. Importance of K_{cat} / k_m . Bi-substrate reactions-brief Reversible and irreversible inhibition, competitive, non-competitive and uncompetitive inhibitions, determination of K_m & V_{max} in presence and absence of inhibitor.

UNIT- III: ENZYME CATALYSIS : Nature of non-enzymatic catalysis, Measurement and expression of enzyme activity-enzyme assays. Definition of IU, katal, enzyme turn over number and specific activity.

Role cofactors in enzyme catalysis : NAD/NADP, FMN/FAD, coenzyme A , biocytin, cobamide, lipoamide, TPP, pyridoxal phosphate, tetrahydrofolate. Mechanism of enzyme action : Acid-base catalysis, electrostatic catalysis & metalion catalysis. Regulation of enzyme activity, covalent modulation. distortion Mechanism of action of trypsin, carboxypeptidase, rinbonuclease and lysozyme.

UNIT-IV: ENZYME PURIFICATION – Methods for isolation, purification and characterization of enzymes. Allosteric enzymes (Ribozyme, Abzyme) – The role of enzymes – AT case

UNIT- V: INDUSTRIAL AND CLINICAL APPLICATION OF ENZYMES- Immobilization of enzyme and their industrial applications. Production of glucose from starch,

cellulose and dextran; use of lactase in dairy industry; production of glucose-fructose syrup from sucrose; use of proteases in food, detergent and leather industry; medical application of enzymes ; use of glucose oxides in enzyme electrodes.

REFERENCES:

1. Price, N.C&Stevens, L (II Ed) Fundamentals of Enzymology. Oxford University Press, Chennai.
2. Whitkar, J.R.(1972) Principles of Enzymology for Food Science, M.Dekker Publishers, New York.
3. Stryer, I(III Ed) Biochemistry. W.H.Freeman & Co. San Francisco.

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OBJECTIVES: To enable the students to:

- Learn basic concepts of enzyme assays
- Identify the various factors that regulate enzyme catalysis
- Optimize different physical and chemical parameters for getting maximum enzyme turnover rate
- Determine affinity of substrate to active site for various enzymes
- Isolate and assay enzymes from various sources and apply the knowledge of enzyme to Industrial and Clinical processes.

Outcomes: Students will be able to

CO1: Able to assay different types of Enzymes

CO2: Determine the activity of enzymes by varying physical and chemical variables

CO3: Establish the parameters that influence enzyme activity

CO4: Use enzyme kinetics to evaluate enzyme activities and their regulation

CO5: Assay Enzymes like phosphatases, amylases and ureases that are of industrial and clinical significance

COURSE :

Enzyme Assays

- a. Salivary amylase using starch as substrate
- b. Effect of temperature on enzyme activity and determination of activation energy.
- c. Effect of pH on enzyme activity and determination of optimum pH.
- d. Effect of enzyme concentration on enzyme activity.
- e. Effect of substrate concentration on enzyme activity and determination of K_m constant.
- f. Assay of acid phosphatase from potatoes.
- g. Assay of urease from (horse gram)
- h. Determination of proteolytic activity of trypsin.

REFERENCES:

1. Plummer, D.T. (1979) An Introduction to Practical Biochemistry, Tata MC Graw Hill Book Co., Bombay.
2. Oser B.L.(1961) Hawk's Physiological Chemistry, Tata MC Graw Hill Book Co. Bombay.
3. Burtis, C.A & Ashwood, E.R (Eds)(V Edn) Tietz Fundamentals of clinical Biochemistry . WBSaunders & Co. New York.

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St. JOSEPH'S COLLEGE FOR WOMEN (AUTONOMOUS) VISAKHAPATNAM
V SEMESTER **BIOCHEMISTRY** TIME:3hrs/week
BCH 5801 (3) **INTERMEDIARY METABOLISM - I** Marks:100
w.e.f 2015 – 2018 (“15AC”) **SYLLABUS**

OBJECTIVES: To enable the students to:

- Realize importance of Bioenergetic with respect to physiological processes
- Prove how the cells extract and utilize energy through numerous enzyme-catalyzed reactions.
- Sketch the entire carbohydrate metabolism and its energetics
- Comprehend lipid metabolism and its role in human body maintenance
- Identify reasons for inborn errors of metabolism of carbohydrates and lipids

COURSE OUTCOMES- Students will be able to

CO1: Identify major pathways of carbohydrate and lipid metabolism

CO2: Quantify bioenergetics and elaborate physiological adaptations of plants and animals

CO3: Appreciate compartmentalization of major metabolic pathways

CO4: Emphasize the role of ATP coupled reactions

CO5: Discuss how disruptions can lead to diseases

COURSE:

UNIT-I: INTRODUCTION TO METABOLISM – General features of metabolism, experimental approaches to study metabolism; use of intact organism, bacterial mutants, tissue slices, stable and radioactive isotopes.

BIOENERGETICS –energy transformation in living systems, free energy concept, exergonic and exergonic reaction, high energy compounds and their role.

UNIT-II: BIOLOGICAL OXIDATION – Redox reactions, Redox potential Structure of mitochondria (review), mitochondrial electron transport chain components, sites of phosphorylation, inhibitors, oxidative phosphorylation – inhibitors, uncouplers chemiosmotic theory of ATP synthesis and transport of reducing potentials into mitochondria. Formation of reactive oxygen species and their disposal through enzymatic reactions.

UNIT-III: CARBOHYDRATE METABOLISM – Reactions and energetics of glycolysis, TCA cycle, Gluconeogenesis, glycogenesis and glycogenolysis. Interconversion of monosaccharides. Reactions and physiological significance of Pentose Pathway. Alcoholic and lactic acid fermentations. Photosynthesis – a brief review. Calvin cycle, C₄ pathway of carbon dioxide fixation.

UNIT-IV: LIPID METABOLISM – Hydrolysis of triacylglycerols, transport of fatty acids into mitochondria, β -oxidation of saturated fatty acids, ATP yield from fatty acids oxidation. Biosynthesis of saturated and unsaturated fatty acids. Metabolism of ketone bodies, oxidation of unsaturated and odd chain fatty acids. Biosynthesis of triglycerides and important phospholipids, glycolipids, sphingolipids and cholesterol. Regulation of cholesterol metabolism.

UNIT-V: Inborn errors of carbohydrate and lipid metabolisms.

REFERENCES:

1. Rama Rao, A.V.S.S. (1989) Text Book of Biochemistry, L.K. & S Publishers, Visakhapatnam.
2. Comn, E.E. and Stump, P.K. (1989) Outline of Biochemistry. Wiley Eastern Ltd., New Delhi.
3. Kleiner, I.S. and Orten, J.M. (1979) Biochemistry. C.V. Mosby & Co., St. Louis.
4. Swaminathan, M (1981) Biochemistry For Medical Students, Geeta Book House Publishers, Mysore.
5. Kuchel , P.W. and Ralston, G.B. (1988) Theory And Problems Of Biochemistry, Mc Graw Hill Book Co., New York.

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COURSE OBJECTIVE: To enable the students to

- Estimate important biomolecules in metabolism
- Learn to identify critical biomolecules and assay them in physiological fluids
- Understand how the biomolecules are utilized in the body
- Analyze carbohydrates and lipids of physiological significance
- Apply knowledge about the various metabolic processes to assay metabolites

COURSE OUTCOMES- Students will be able to

CO1: Comprehend the functioning metabolic pathways

CO2: Gain expertise in determination of reducing sugars which has importance in research and pharmaceutical industries

CO3: Handle with expertise scientific equipment

CO4: Estimate Phosphorus in biological fluids with accuracy and precision

CO5: Estimate lipids in biological samples which is of importance in medical labs

COURSE:

1. Estimation of pyruvate
2. Estimation of phosphorous by fiske subbarow method
3. Estimation of alcohol by colorimetric method
4. Estimation of glucose by nelson somogyi method
5. Estimation of glucose by benedicts method
6. Estimation of cholesterol

REFERENCES:

1. Plummer, D.T.(1979) An Introduction to Practical Biochemistry, Tata MC Graw Hill Book Co., Bombay.
2. Oser, B.L.(1961) Hawk's Physiological Chemistry, Tata MC Graw Hill Book Co. Bombay.

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St. JOSEPH'S COLLEGE FOR WOMEN (AUTONOMOUS) VISAKHAPATNAM
VSEMESTER **BIOCHEMISTRY** TIME:3Hrs/week
BCH 5802(3) **INTERMEDIARY METABOLISM - II** MARKS: 100
w.e.f 2015 – 2018("15AC") **SYLLABUS**

OBJECTIVES: To Enable students to:

- Comprehend amino acid metabolism, and learn the process of urea formation
- Explain Nucleic acid metabolism and interpret its usage in cancer therapy
- Relate porphyrin metabolism to liver disorders
- Realize the importance of Vitamins in physiological functions
- Correlate physiological disorders with Nutritional deficiencies

COURSE OUTCOMES- Students will be able to

CO1: Define major pathways of amino acids, nucleic acid and porphyrin metabolisms

CO2: Implement feedback mechanism and inhibitor concepts in drug designing for cancer therapy

CO3: Be equipped with knowledge on vitamins, sources and functions

CO4: Enumerate energy requirements for various individuals based on age and determine the calorific value of different bio molecules like proteins, fats and carbohydrates

CO5: Identify and suggest diet for individuals suffering from protein energy malnutrition

COURSE:

UNIT - I: AMINO ACID METABOLISM – General reactions of amino acid metabolism:transamination, oxidative deamination and decarboxylation.Urea cycle. Degradation and biosynthesis of aromatic & branched chain amino acids Glycogenic and ketogenic amino acids. Inborn errors of amino acid metabolism.

UNIT- II: NUCLEOTIDE METABOLISM – Sources of the atoms in the purine and pyrimidine molecules. Biosynthesis and degradation of purines and pyrimidines. Regulation of purine and pyrimidine synthesis.
Inborn Errors of Nucleotide metabolism.

UNIT - III: PORPHYRIN METABOLISM – Biosynthesis and degradation of porphyrins. Production of bile pigments. Inborn Errors of Porphyrin metabolism.

UNIT - IV: FAT SOLUBLE VITAMINS AND WATER SOLUBLE VITAMINS –
FAT SOLUBLE VITAMINS – Structure, sources, biochemical role and deficiency disorders. Minerals: Trace elements and their disorders.
WATER SOLUBLE VITAMINS – Structure, sources, biochemical role and deficiency disorders

UNIT-V:NUTRITIONAL BIOCHEMISTRY Balanced diet, Calorific values of foods and their determination by bomb calorimeter. BMR and factors affecting its specific dynamic action (SDA) of foods. energy requirements and recommended dietary allowance (RDA) for children, adults, pregnant and lactating women. Sources of complete and incomplete proteins. Biological value of proteins .Role of essential fatty acids in human nutrition.Malnutrition- Kwashiorkar, Marasmus and PEM

REFERENCES:

1. Rama Rao, A.V.S.S. (1989) Text Book of Biochemistry, L.K. & S Publishers, Visakhapatnam.
2. Conn, E.E. and Stump, P.K. (1989) Outline of Biochemistry. Wiley Eastern Ltd., New Delhi.
3. Kleiner, I.S. and Orten, J.M. (1979) Biochemistry. C.V. Mosby & Co., St. Louis.
4. Swaminathan, M (1981) Biochemistry For Medical Students, Geeta Book House Publishers, Mysore.
5. Kuchel , P.W. and Ralston, G.B. (1988) Theory And Problems Of Biochemistry, Mc Graw Hill Book Co., New York.
6. Goodhart, R.S., & Shils M.E. (1980) – Modern Nutrition in Health and Disease – K.M.Varghese & Co., New Delhi.
7. Davidson, S., and Passmore, R. (1977) – Human Nutrition and Dietetics – E & S., Livinstone Ltd., London.

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OBJECTIVES: To enable students to-

- Estimate the amount of toxic nitrogen compounds in urine samples
- Estimate minerals in serum
- Isolate nucleic acids from natural sources which has importance in molecular biology studies
- Quantify intermediary metabolites of biological importance
- Extract oils from plant sources and estimate their quantity

Course Outcomes- Students will be able to-

CO1: Skilled in Estimation of Urea and Uric acid which is requires in diseases like Gout and Uricemia

CO2: Estimate citric acid content in fruits

CO3 : Isolate casein from milk and estimate its calcium content

CO4: Develop ability Extract lipids from various sources

CO4: Determine the degree of unsaturation in oils

Course-

1. Estimation of urea
2. Estimation of uric acid
3. Estimation of ascorbic acid
4. Estimation of iron
5. Isolation of DNA from onions
6. Qualitative test of urine for identification of bilirubin uroporphyrins and heme
7. Estimation of calcium by titrimetry .
8. Isolation of casein lactose from milk.
9. Determination of acid value of an oil .
10. Extraction & estimation of lipid from oil seeds (ground nut)

REFERENCES:

1. Plummer, D.T.(1979) An Introduction to Practical Biochemistry, Tata MC Graw Hill Book Co., Bombay.
2. Oser, B.L.(1961) Hawk's Physiological Chemistry, Tata MC Graw Hill Book Co. Bombay.

St. JOSEPH'S COLLEGE FOR WOMEN (AUTONOMOUS) VISAKHAPATNAM
VI SEMESTER **BIOCHEMISTRY** TIME:3Hrs/week
BCH-E1-6801 (3) **IMMUNOLOGY & CLINICAL BIOCHEMISTRY** Max.Marks:100
w.e.f. 2015-2018('15AC' batch) **SYLLABUS**

OBJECTIVES: To enable students to

- Be aware of the components of immune system and their role in immunity
- Describe antigen- antibody reactions of clinical significance
- Identify various methods of sample collection and storage
- Evaluate biological fluids for enzymes in diseased states
- Correlate levels of ions, enzymes and proteins for their role in disorders

Course Outcomes- Students will be able to-

CO1: Display enhanced knowledge on concepts of Immune system

CO2: Explain the diversity of antibodies at genetic level and understand the insights of hybridoma technology

CO3: Incorporate the concepts of clinical biochemistry for sample collection and storage

CO4: Interpret the role of clinically important enzymes in disease states

CO5: Utilize knowledge on disorders of carbohydrates, few proteins and lipids in disease diagnosis

COURSE:

A. Immunology

UNIT – I: Concept of immunity, classification – Humoral and cellular immunity . Cells and organs of immune system. Antigens – Nature of antigens, histocompatible antigens – elementary knowledge on Haptens. Immunoglobullins – Structure and function. Types of antibodies, formation of antibodies in the body.

UNIT – II: Clonal selection theory , cooperation of T-Cell with B cell. Secretion of antibody. Genetic basis of antibody diversity. Antigen – Antibody reaction in vivo and in vitro. Components of complement, Complement fixation reaction. Monoclonal antibody – preparation and application in biology. Immunodiagnostics. ELISA, RIA. Vaccines and their classification . Immunological tolerance and Immunosuppression, Hypersensitivity and allergy. Autoimmune diseases.

B. Clinical Biochemistry

UNIT – III: Basic Concepts of Clinical Biochemistry

a. Definition and scope of clinical biochemistry in diagnosis, Quality control manual versus – automation in clinical laboratory.

b. Collection and preservation of biological fluids (blood, serum, plasma, urine and CSF) Chemical analysis of blood, urine and CSF. Normal values for important constituents (In SI units) in blood (plasma/serum), CSF and urine, clearance test for urea.

UNIT – IV: Clinical Enzymology

a. Definition of functional and non-functional plasma enzymes. Isozymes and diagnostic tests. Enzyme pattern in health and disease with special mention of plasma lipase, amylase, cholinesterase, alkaline and acid phosphatase, SGOT, SGPT, LDH and CPK.

b. Functional tests of kidney, liver and gastric fluids.

UNIT – V: Disorders related to metabolism

Plasma proteins in health and diseases. Disorders of blood coagulation (Haemophilia) Haemoglobinopathies – Sickle Cell Anaemia (SCA), Beta – Thalessemia.

Disorders of Carbohydrate Metabolism: Hypoglycemia & Hyperglycemia, Diabetes mellitus & its classification, GTT, diabetic ketoacidosis.

Disorders of Lipid Metabolism: Plasma lipoproteins, lipoproteins, hyper cholestrolemia, Artherosclerosis.

REFERENCES:

1. Goodhart, R.S., & Shils M.E. (1980) – Modern Nutrition in Health and Disease – K.M.Varghese & Co., New Delhi.
2. Davidson, S., and Passmore, R. (1977) – Human Nutrition and Dietetics – E & S., Livingstone Ltd., London.
3. Plummer, D.T. (1979) An Introduction to Practical Biochemistry, Tata MC Graw Hill Book Co., Bombay.
4. Oser, B.L. (1961) Hawk's Physiological Chemistry, Tata MC Graw Hill Book Co. Bombay.
5. Burits, C.A & Ashwood, E.R (Eds)(V Edn) Tietz Fundamentals of Clinical Biochemistry. WBSaunders & Co. New York.

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OBJECTIVES: To enable the students to -

- Develop competence in Immuno-techniques
- Acquire concepts of quantification of antigens and antibodies
- Conduct serum- antibody quantification methods
- Determine activity of serum enzyme of clinical importance
- Quantify aldoses and ketoses in urine samples

Course outcomes- The students will be able to

CO1: Demonstrate the methods of immunization

CO2: Conduct antigen- antibody reactions based on desired sensitivity

CO3: Demonstrate precipitation reactions

CO 4: Quantify variables in biological fluids

CO5 : Interpret diagnostic reports of metabolites to enzymes for clinical disorders

Immunology & Clinical Biochemistry

COURSE:

1. Techniques of immunization and bleeding.
2. Visualization of antigen – antibody reaction by Ouchterlony technique .
3. Immunoprecipitation and precipitin curve.
4. Radial Immuno Diffusion
5. Pregnancy test
6. Estimation of urinary creatine .
7. Estimation of serum bilirubin
8. Determination of serum alkaline phosphatase activity .
9. Qualitative test for albumin, glucose, ketone bodies in Urine.

REFERENCES:

1. Plummer, D.T.(1979) An Introduction to Practical Biochemistry, Tata MC Graw Hill Book Co., Bombay.
2. Oser, B.L.(1961) Hawk's Physiological Chemistry, Tata MC Graw Hill Book Co. Bombay.
3. Burtis, C.A.&Ashwood, E.R(Eds)(V Edn) Tietz Fundamentals of Clinical Biochemistry. W.B.Saunders &Co. New York.
4. Human Physiology – Guyton
5. Clinical Biochemistry – VARLEY (Practicals)

St. JOSEPH'S COLLEGE FOR WOMEN (AUTONOMOUS) VISAKHAPATNAM
VI SEMESTER **BIOCHEMISTRY** TIME: 3Hrs/week
BCH-E2- 6801(3) **PHARMACEUTICAL BIOCHEMISTRY** Max. Marks: 100
w.e.f. 2019-2020 ('19AG' batch) **SYLLABUS**

OBJECTIVES: To enable the students to--

- Imbibe the concepts of biopharmaceutics
- Reflect upon the role of receptor mediated drug absorption
- Acquire insights into drug clearance and xenobiotics
- Narrate role of anticancer drugs
- Pronounce reasons for drug induced side effects

Course Outcomes- Students will be able to

CO1: Reflect upon concepts in biopharmaceutics and pharmacokinetics

CO2: Describe the process of drug absorption, distribution, metabolism and elimination

CO3: Design and evaluate dosage regimens

CO4: Identify potential drugs for cancer therapy.

CO5: Critically evaluate reasons for side effects of drugs

Course-

UNIT-I: Drugs; History of drugs classification of drugs, routes of drug administration, absorption and distribution of drugs, factors influencing drug absorption and elimination of drugs.

UNIT-II : Drug- receptor interactions, involvements of binding forces in drug receptor interaction drug action not mediated by receptors

UNIT-III: Drug metabolism; mechanism of phase I and phase II enzyme interactions, biochemical importance of xenobiotic metabolism

UNIT-IV: Cancer ; and principles of cancer chemotherapy, Mode of action of anticancer drugs, antimetabolites, antibiotics ,alkylating agents and other agents.

UNIT- V: Adversed drug reaction and drug induced side effects, biological effects of drug abuse and drug dependence, drug tolerance and intolerance.

REFERANCES:

1. The pharmacology vol1 and 11-good man and gillman
2. Basic pharmacology- foxter cox
3. Oxford text book of clinical pharmacology and drug therapy, D.G Grahma Smith and J.K Aronson
4. Pharmacology and pharmatherapics - R.S. Satoskar ,S.D. Bhandhakarand
5. Essentials of pharmacotherapeutics, Barav.F.S.K

OBJECTIVES: To enable the students to -

- Develop competence in Immuno-techniques
- Acquire concepts of quantification of antigens and antibodies
- Conduct serum- antibody quantification methods
- Determine activity of serum enzyme of clinical importance
- Quantify aldoses and ketoses in urine samples

Course outcomes- The students will be able to

CO1: Demonstrate the methods of immunization

CO2: Conduct antigen- antibody reactions based on desired sensitivity

CO3: Demonstrate precipitation reactions

CO 4: Quantify variables in biological fluids

CO5 : Interpret diagnostic reports of metabolites to enzymes for clinical disorders

Immunology & Clinical Biochemistry

COURSE:

1. Techniques of immunization and bleeding.
2. Visualization of antigen – antibody reaction by Ouchterlony technique .
3. Immunoprecipitation and precipitin curve.
4. Radial Immuno Diffusion
5. Pregnancy test
6. Estimation of urinary creatine .
7. Estimation of serum bilirubin
8. Determination of serum alkaline phosphatase activity .
9. Qualitative test for albumin, glucose, ketone bodies in Urine.

REFERENCES:

1. Plummer, D.T.(1979) An Introduction to Practical Biochemistry, Tata MC Graw Hill Book Co., Bombay.
2. Oser, B.L.(1961) Hawk's Physiological Chemistry, Tata MC Graw Hill Book Co. Bombay.
3. Burtis, C.A.&Ashwood, E.R(Eds)(V Edn) Tietz Fundamentals of Clinical Biochemistry. W.B.Saunders &Co. New York.
4. Human Physiology – Guyton
5. Clinical Biochemistry – VARLEY (Practicals)

St. JOSEPH'S COLLEGE FOR WOMEN (AUTONOMOUS) VISAKHAPATNAM
VI SEMESTER **BIOCHEMISTRY** TIME: 3Hrs/week
BCH-E3-6801(3) **PLANT BIOCHEMISTRY AND MEDICINAL PLANTS** Max. Marks: 100
w.e.f. 2019-2020 ('19AG' batch) **SYLLABUS**

OBJECTIVES: To enable the students to--

- Imbibe concepts of cell biology and plant physiology
- Gain insights into biochemical and physiological processes in higher plants
- Interpret the role of plant growth regulators
- Classify role of secondary plant products
- Summarize role of secondary metabolites in native medicinal therapies

Course Outcomes- Students will be able to

CO1: Comprehend different fundamental concepts related to plant cell organelles

CO2: Reflect upon the physiology of photosynthesis, respiration, plant hormone to stress physiology

CO3: Analyze the structure and functioning of various phytohormones

CO4: Classify secondary metabolites and develop methods to identify them

CO5: Appreciate the role of secondary metabolites in Ayurveda and native treatments

Course-

UNIT- I: Plant cell-structure and functions of subcellular organelles, plant cell wall, mechanism of water absorption, Ascent of sap. Transpiration-types stomatal openings, mechanism and factors affecting transpiration

UNIT- II: Physiology of flowering; introduction , Photoperiodism, short day plants ,long day plants ,day neutral plants, photoperiodic induction, Photoperiodism and quality of light, phytochrome- mode of action, mechanism of action physiological responses , Flowering hormone, vernalization- mechanism, stress physiology.

UNIT-III: Plant growth regulators- chemistry, biosynthesis, mode of action, distribution and physiological effects of auxins, gibberellins, cytokinins, ABA and ethylene, biochemistry of seed dormancy, seed germination, fruit ripening and senescence.

UNIT-IV: Secondary metabolites /secondary plant products- Terpenoids , phenols, flavonoids , alkaloids. Basic methods to identify plant metabolites.

UNIT V: Medicinal value of different parts of plants, Role of secondary metabolites in Ayurveda and Sidha treatment, medicinal value of Amla, Stevia, Ashwagandha and Turmeric.

REFERANCES:

1. Plant physiology, Verma, seventh edition, emkay publication 2001
2. Plant physiology S.N. Pandey and B.K. Simha Vikas publishing house Pvt . Ltd 3rd Edition

3. Plant Biochemistry and molecular biology Peter Jhea, Richard C.Leegood
4. Introduction to plant physiology William .G.Hopkins,Norman. P.A. Hunger, 3rd Edition
5. Plant metabolism by H.D. Kumar, H.N Singh
6. Hand book of medicinal plants – Prajapathi, Purohit, Sharma, Kumar
7. Medicinal plants- acompendium of 500 species.

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OBJECTIVES: To enable the students to -

- Learn Immunization techniques and bleeding methods to obtain antibodies
- Learn basic concepts of quantification of antigens and antibodies
- Conduct various antigen- antibody reactions for identification and quantification of antigens in serum
- To determine activity of serum enzyme of clinical importance
- Quantify few aldoses and ketoses in urine samples

Course outcomes- The students will be able to

CO1: Demonstrate the methods of immunization

CO2: Conduct antigen- antibody reactions based on desired sensitivity

CO3: Demonstrate precipitation reactions

CO 4: Quantify variables in biological fluids

CO5 : Interpret diagnostic reports of metabolites to enzymes for clinical disorders

Immunology & Clinical Biochemistry

COURSE:

1. Techniques of immunization and bleeding.
2. Visualization of antigen – antibody reaction by Ouchterlony technique .
3. Immunoprecipitation and precipitin curve.
4. Radial Immuno Diffusion
5. Pregnancy test
6. Estimation of urinary creatine .
7. Estimation of serum bilirubin
8. Determination of serum alkaline phosphatase activity .
9. Qualitative test for albumin, glucose, ketone bodies in Urine.

REFERENCES:

1. Plummer, D.T.(1979) An Introduction to Practical Biochemistry, Tata MC Graw Hill Book Co., Bombay.
2. Oser, B.L.(1961) Hawk's Physiological Chemistry, Tata MC Graw Hill Book Co. Bombay.
3. Burtis, C.A.&Ashwood, E.R(Eds)(V Edn) Tietz Fundamentals of Clinical Biochemistry. W.B.Saunders &Co. New York.
4. Human Physiology – Guyton
5. Clinical Biochemistry – VARLEY (Practicals)

St. JOSEPH'S COLLEGE FOR WOMEN (AUTONOMOUS) VISAKHAPATNAM
VI SEMESTER **BIOCHEMISTRY** TIME:3Hrs/Week
BCH-A1-6801 (3) **INTRODUCTION TO FOOD TECHNOLOGY** Max.Marks:100
w.e.f. 2015-2018('15AC' batch) **SYLLABUS**

OBJECTIVES: To enable the students to-

- Explore the evolution of food processing.
- Imbibe knowledge on the structure, composition, nutritional quality and post harvest changes of various cereals, pulses, millets
- Classify oils for their types and characteristics
- Assess quality of meat, fish and poultry products and evaluate reasons for food spoilage
- Highlight on processing of fruits and vegetables harvest; milk and milk products processing

COURSE OUTCOMES - The students will be able to

CO1: Gain exhaustive knowledge on food processing methods

CO2: Analyze oils to establish their composition

CO3: Gain insights on harvest and post harvest modifications in fruits and vegetables

CO4: Realize the importance of dairy and fishery industries

CO5: Apply relevant food processing techniques

Course-

COMPOSITIONAL, NUTRITIONAL AND TECHNOLOGICAL ASPECTS OF PLANT FOODS

UNIT - I: CEREALS MILLETS AND PULSES (22 LECTURES)

1. Introduction, structure, composition and uses and by-products of cereals and coarse cereals.
2. Wheat- Structure and composition of wheat, types (hard, soft/ strong, weak) Diagrammatic representation of longitudinal structure of wheat grain and process of malting, Gelatinization of starch, types of browning.
3. Rice- Composition of rice obtained by different dehusking methods, parboiling of rice advantages and disadvantages.
4. Millets -Varieties, composition and uses of maize, sorghum, barley, rye, oats, triticale, pearl millet and finger millet.
5. Introduction, common names and scientific names of different pulses. □ Chemical composition of pulses, processing of pulses- soaking, germination, decortications, cooking and fermentation. Toxic constituents in pulses and its Detoxification processes.

UNIT – II: FATS AND OILS (6 LECTURES)

1. Classification of lipids, types of fatty acids - saturated fatty acids, unsaturated fatty acids, essential fatty acids, trans fatty acids
2. Refining of oils, types- steam refining, alkali refining, bleaching, steam deodorization, hydrogenation.
3. Rancidity - hydrolytic and oxidative rancidity and its prevention.
4. Define - margarine, butter, hydrogenated vegetable oil, lard. .

UNIT – III: FRUITS AND VEGETABLES (8 LECTURES)

Classification of fruits and vegetables, general composition, enzymatic browning, Names and sources of pigments, Dietary fibre)

Post harvest changes in fruits and vegetables – Climacteric rise, horticultural maturity, physiological maturity, physiological changes, physical changes, chemical changes, pathological changes during the storage of fruits and vegetables. (Ch-8, Srilakshmi)

Compositional, Nutritional and Technological aspects of animal foods

UNIT – IV: FLESH FOODS - MEAT, FISH, POULTRY (12 LECTURES)

1. Meat - Definition of carcass, concept of red meat and white meat, composition of meat, marbling, post-mortem changes in meat- rigor mortis, tenderization of meat, ageing of meat.

2. Fish - Classification of fish (fresh water and marine), aquaculture, composition of fish, characteristics of fresh fish, spoilage of fish- microbiological, physiological, biochemical.

3. Poultry - Structure of hen's egg, composition and nutritive value, egg proteins, characteristics of fresh egg, deterioration of egg quality, difference between broiler and layers.

UNIT – V: MILK AND MILK PRODUCTS (8 lectures)

1. PFA definition of milk, typical chemical composition of milk of different species i.e. buffalo, cow, goat. Composition of milk, its constituents, various steps in processing of milk. An overview of types of market milk and milk products cheese, paneer, ice cream, ghee, butter, butter oil, flavoured milk, imitation milk.

RECOMMENDED READINGS :

1. Manay, S. & Shadaksharaswami, M., Foods: Facts and Principles, New Age Publishers, 2004

2. B. Srilakshmi, Food science, New Age Publishers, 2002

3. Meyer, Food Chemistry, New Age, 2004

4. Kenneth F. et al, edited- Vol-1, 2, The Cambridge World History of Food, Cambridge Univ. Press, 2000.

5. Martin Eastwood, Second edition, Principles of Human Nutrition, Blackwell publishing, 2003

6. Potter, Norman. M., Food Science, CBS Publication, 1996

7. Manay, S. & Shadaksharaswami, M., Foods: Facts and Principles, New Age Publishers, 2004

8. De Sukumar. , Outlines of Dairy Technology, Oxford University Press, 2007

9. Frazier William C and Westhoff, Dennis C. Food Microbiology, TMH, New Delhi, 2004

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OBJECTIVES: To enable students to

- Understand estimation techniques of adulterants in foods.
- Identify the contaminants in wide variety of foods
- Analyze milk and milk products for adulterants
- Conduct tests on confectioneries for adulterants
- Determination of shelf life for flesh foods and vegetables

COURSE OUTCOMES - Students will be able to

CO1: Analyze the adulterants in food samples

CO2: Determine shelf life

CO3: Establish the presence of adulterants in milk

CO4: Identify post harvest changes in fruits and vegetables

CO5: Gain hands-on experience in sampling

Course:

1. Methods of sampling.
2. Identification of different non-perishable commodities-cereals, millets and their by-products.
3. Quality evaluation/inspection of different foods.
 - i. Spices and Condiments
 - ii. Pulses
 - iii. Nuts and oilseeds
 - iv. Tea and coffee
4. Identification of pigments and concept of post harvest changes in fruits and vegetables- climacteric, non climacteric and senescence
5. Estimation of pH of different foods
6. Adulteration tests for different foods:
 - i. Milk and milk products
 - ii. Tea and coffee etc
7. To give the concept of shelf life of different foods.(processed and unprocessed)
8. To perform pasteurization and sterilization of foods.

REFERENCES-

1. A Food Technology Lab Manual, Rashida Rajuva TA & Joy PP
2. . S. K. Sharma, S.J. Mulvaney, and S.S.H. Rizvi, Food Process Engineering: Theory and Laboratory Experiments, Wiley and Sons, 2000
3. 2. H. Pandey, H.K. Sharma, R.C. Chouhan, B.C. Sarkar and M.C. Bera, Experiments in Food Process Engineering, CBS Publishers and Distributors, 2004
4. 3. M.A. Rao, S.S. H. Rizvi and A.K. Dutta, Engineering properties of Foods, 3rd ed., Marcel Dekker, 2005

St. JOSEPH'S COLLEGE FOR WOMEN (AUTONOMOUS) VISAKHAPATNAM
VI SEMESTER **BIOCHEMISTRY** TIME:3Hrs/Week
BCH-A2-6801 (3) **FOOD PROCESSING AND ENGINEERING** Max.Marks:100
w.e.f. 2015-2018('15AC' batch) **SYLLABUS**

OBJECTIVES: To enable students to

- Identify cold storage processing methods for foods
- Recognize the role of dehydration on shelf life
- Appreciate the importance of Food irradiation
- Explore packaging methods
- Correlate role of Thermal processing in preventing microbial contamination

COURSE OUTCOMES - The students will be able to

CO1: Comprehend food preservation methods

CO2: Identify dehydration methods for food samples

CO3: Well versed in methods of packaging

CO4: Analyze upon food contaminants.

CO5: Describe principles of thermal processing

FOOD PROCESSING OPERATIONS:

UNIT – I:

1. A. Cold preservation (4 Lectures)

Freezing: requirements of refrigerated storage - controlled low temperature, air circulation and humidity, changes in food during refrigerated storage, progressive freezing, changes during freezing –concentration effect and ice crystal damage, freezer burn. Refrigeration load, factors determining freezing rate-food composition and non compositional influences

B. Freezing- Mechanism and freezers (6 Lectures)

2. Freezing methods -direct and indirect, still air sharp freezer, blast freezer,fluidized freezer, plate freezer, spiral freezer and cryogenic freezing.(Ch 9, Potter)

UNIT – II: Dehydration (10 Lectures)

1. Normal drying curve , effect of food properties on dehydration , change in food during drying, drying methods and equipments air convection dryer, tray dryer, tunnel dryer ,continuous belt dryer , fluidized bed dryer, dryer, drum dryer, vacuum dryer ,freeze drying ,foam mat drying.

UNIT – III: Food Irradiation and Microwave Heating (7 Lectures)

1. Ionizing radiation and sources, unit of radiations, direct and indirect radiation effects, safety and wholesomeness of irradiated food. Microwave heating and application.

UNIT – IV: Packaging of foods and Material handling (11 Lectures)

1. Packaging: Properties of packaging material, factors determining the packaging requirements of various foods and brief description of packaging of frozen products, dried products, fats and oils and thermally processed foods contaminants formed during processing – nitrosamines, acrylamide etc natural food contaminants and contaminants from packaging material.

2. Elementary concept of material handling in food industry, equipment and functioning of belt conveyor, screw conveyor, bucket elevator and pneumatic conveyor.

UNIT – V: Thermal processing and Separation processes (10 Lectures)

1. Introduction, classification of Thermal Processes, Principles of thermal processing, Thermal resistance of microorganisms, Thermal Death Time, Lethality concept, characterization of heat penetration data, Thermal process Calculations

2. Principles and methods of: distillation, extraction, washing, filtration, sedimentation, sieving and centrifugation

RECOMMENDED READINGS :

1. Desrosier NW and Desrosier JN, The Technology of Food Preservation, CBS Publication, New Delhi, 1998
2. Paine FA and Paine HY, Handbook of Food Packaging, Thomson Press India Pvt Ltd, New Delhi- 1992
3. Potter NH, Food Science, CBS Publication, New Delhi, 1998
4. Ramaswamy H and Marcott M, Food Processing Principles and Applications CRC Press, 2006
5. Rao PG, Fundamentals of Food Engineering, PHI Learning Pvt Ltd, New Delhi, 2010
6. Toledo Romeo T, Fundamentals of Food Process Engineering, AspenPublishers, 1999

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St. JOSEPH'S COLLEGE FOR WOMEN (AUTONOMOUS) VISAKHAPATNAM
VI SEMESTER **BIOCHEMISTRY** TIME:2Hrs/Week
BCH-A2-6851 (2) **FOOD PROCESSING AND ENGINEERING** Max.Marks:50
w.e.f. 2015-2018('15AC' batch) **PRACTICALS SYLLABUS – IV A2**

OBJECTIVES: To enable students to

- Analyze available cold storage processing methods for foods
- Assess shelf life of food items
- Work upon food canning methods
- Demonstrate osmotic dehydration of fruits and vegetables
- Perform thermal processing of foods to prevent microbial contamination

COURSE OUTCOMES – Students will be able to

CO1: Use microwave processing of food

CO2: Perform freezing techniques.

CO3: Conduct dehydration process to improve shelf life of foods

CO4: Learn canning methods

CO5: Test packaged foods.

Course-

1. Comparison of conventional and microwave processing of food
2. Preservation of food by the process of freezing
3. Drying of food using Tray dryer/other dryers
4. Preservation of food by canning(Fruit/Vegetable/meat)
5. Cut-out analysis of canned food
6. Osmotic dehydration
7. Minimal Processing
8. Testing of Packaging material

REFERENCES

1. Joshi.V.K., (2015),”Indigenous Fermented Foods of South Asia”, CRC Press.
2. Alan H. Varnam, (2012), “Milk and Milk Products: Technology, chemistry and microbiology”, Springer Science & Business Media Publishers.
3. Robinson, R. K., (2012), “Modern Dairy Technology: Volume 2 Advances in Milk Products”, Springer Science & Business Media Publishers.

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St. JOSEPH'S COLLEGE FOR WOMEN (AUTONOMOUS) VISAKHAPATNAM
VI SEMESTER **BIOCHEMISTRY** TIME:3Hrs/Week
BCH-A3-6801 (3) **FOOD SAFETY AND QUALITY MANAGEMENT** Max.Marks:100
w.e.f. 2015-2018('15AC' batch) **SYLLABUS**

OBJECTIVES: To enable students to-

- Analyze food hazards and learn the importance of food safety
- Comprehend the impact of hazards and indicator organisms associated with food
- Identify the importance food laws and food safety management systems
- Recognize the quality attributes of food and dynamics associated with Agri-food management systems
- Identify food additives and their limits of usage

Course Outcomes- The students will be able to

CO1: Evaluate quality of food and feed products

CO2: Use the concept of Process Quality Management to maintain food quality

CO3: Implement total quality management and Hazard Analysis Critical Control Point (HACCP) systems

CO4: Correlate role of risk analysis in the development of Food Safety Objectives (FSOs)

CO5: Discuss the Agri food management systems

Course-

UNIT – I: A. INTRODUCTION TO FOOD SAFETY (3 Lectures)

Definition, Types of hazards, biological, chemical, physical hazards, Factors affecting Food Safety, Importance of Safe Foods

B. Food Hazards of Physical Chemical and Biological Origin (5 Lectures)

Introduction, Physical Hazards with common examples, Chemical Hazards(naturally occurring ,environmental and intentionally added) Impact on health Control measures, Indicator Organisms, Food borne pathogens: bacteria, Food borne pathogens: viruses, Food borne pathogens: eukaryotes, Seafood and Shell fish poisoning, Mycotoxins

UNIT – II: A. Management of hazards 5 Lectures

Need, Control of parameters, Temperature control, Food storage

B. Hygiene and Sanitation in Food Service Establishments 8 Lectures

Introduction, Sources of contamination, Control methods using physical and chemical agents, Waste Disposal,Pest and Rodent Control Personnel Hygiene Food Safety Measures.

UNIT – III: Food laws, Food Standards and Recent concerns 4 Lectures

Indian Food Regulatory Regime, Global Scenario History, National and International laws & Regulations:USFDA, EU, Codex alimentarius, World Trade Organization (Sanitary and Phyto Sanitary agreement, Technical Barriers in Trade), -Standards of Identity, Standards of Quality,Standards of fill of the container. Packaging ,Product labelling and Nutritional labeling,Organic foods, Newer approaches to food safety

UNIT – IV: Food Quality (8 Lectures)

1. Introduction to food quality management – Definition, quality concepts, quality, quality perception, quality attributes, safety, health, sensory, shelf life, convenience, extrinsic attributes, factors affecting food behavior.

2. Quality in the Agri- food production chain-Techno- managerial approach, food quality relationship and food quality management functions. Dynamics on the agri- food production chain, core developments in food quality management.

UNIT – V: Food Additives (12 Lectures)

1. Chemical, technological and toxicological aspects
2. Risk assessment studies- Safety and quality evaluation of additives and contaminants, Acute and chronic studies, NOEL, ADI, LD50
3. Introduction, need of food additives in food processing and preservation.Characteristics and classification of food additives.
4. Antimicrobial agents. -Nitrites, sulphides, sulphur di oxide, sodium chloride, hydrogen peroxide.
5. Antioxidants - Introduction, mechanism of action, natural and synthetic anti-oxidants, technological aspect of antioxidants.
6. Sweeteners- Introduction, importance, classification- natural and artificial, chemistry, technology and toxicology, consideration for choosing sweetening agents.
7. Colors- Introduction, importance, classification- natural, artificial, and natural identical, FD&C Dyes and Lakes. Use of plant tissue culture, polymeric colors etc for color

RECOMMENDED READINGS:

1. Lawley, R., Curtis L. and Davis,J. The Food Safety Hazard Guidebook , RSC publishing, 2004
2. De Vries. Food Safety and Toxicity, CRC, New York, 1997
3. Marriott, Norman G. Principles of Food Sanitation, AVI, New York, 1985
4. Forsythe, S J. Microbiology of Safe Food, Blackwell Science, Oxford, 2000 & Sons; USA, 1987
5. Pieterneel A, Luning, Willem J. Marcelis, Food Quality Management Technological and Managerial principles and practices, Wageningen,2009.
6. Brannen and etal,Food Additives, Marcel Dekker,New York,1990
7. Shalton , Principles and Practices for the safe processing of Foods.
8. DeMan, 3rd edition, Principles of Food Chemistry, Springer, 2007.

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St. JOSEPH'S COLLEGE FOR WOMEN (AUTONOMOUS) VISAKHAPATNAM
VI SEMESTER **BIOCHEMISTRY** TIME:2Hrs/Week
BCH-A3-6851 (2) **FOOD SAFETY AND QUALITY MANAGEMENT** Max.Marks:50
w.e.f. 2015-2018('15AC' batch)**PRACTICAL SYLLABUS – IV A3**

OBJECTIVES: To enable students to-

- Conduct procedures for identification of microbial contaminants in food
- Assess water samples for Enterobacteriaceae members
- Differentiate bacteria using IMViC tests
- Conduct food sample analysis- qualitatively and quantitatively
- Estimate pesticides and chemical residues in food

Course Outcomes- The students will be able to

CO1: Analyze food and water samples for microbial contamination

CO2: Estimate microbial contaminants in food, milk and water samples

CO3: Conduct survey for surface sanitation of various area and identify microbial count

CO4: Inspect pulses, cereals and spices for their quality

CO5: Estimate sulphur residues in beverages

Course-

1. Microbiological Examination of different food sample
- 2.. Bacteriological Analysis of Water
3. Assessment of surface sanitation by swab/rinse method
4. Biochemical tests for identification of bacteria
5. Scheme for the detection of food borne pathogens
6. Qualitative tests for fats and oils, spices and condiments.
7. Inspection of quality as per National and International standards for various food stuffs- pulses, spices,etc
8. Estimation of residual sulphur dioxide in beverages.
9. Estimation of pesticide residues in food/water.
10. Estimation of benzoic acid in foods.

REFERENCES

1. Ray , Bibek; Arun Bhunia,(2013), “Fundamental Food Microbiology”, CRC Press.
2. Adams ,Martin R, Maurice O Moss, Peter McClure (2015), “Food Microbiology”, Royal Society of Chemistry, Cambridge.
3. Jay, James M.(2012), “Modern Food Microbiology”, Springer Science & Business Media., Maryland.

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