Phone : 08819 - 246126 / 246926 Website : www.svkpandksrajucollege.org.in
S.V.K.P. & Dr. K.S. RAJU ARTS & SCIENCE COLLEGE
(Autonomous)
Recognized by UGC as "College with Potential for Excellence"
Accredited by NAAC with "A" Grade
(Affiliated to ADIKAVI NANNAYA UNIVERSITY - Recognised by Govt. of Andhra Pradesh)
PENUGONDA-534 320, West Godavari District., (A.P.)

I Semester Syllabus (w.e.f. 2019-20 Admitted Batch)

BIOCHEMISTRY

19BC1: BIOMOLECULES

Unit – I: Biophysical Concepts 12 hours

Water as a biological solvent and its role in biological processes. Biological relevance of pH, measurement of pH, pKa values, Biopolymers such as proteins and nucleic acids. Importance of buffers in biological systems, ion selective electrodes, and oxygen electrode. Donnan membrane equilibrium. Significance of osmotic pressure in biologicalsystems,

Unit – II: Carbohydrates 12 hours

Carbohydrates: Classification, monosaccharides, D and L designation, open chain and cyclic structures,epimers and anomers, mutarotation, reactions of carbohydrates (due to functional groups - hydroxyl ,aldehyde and ketone). Amino sugars, Glycosides. Structure and biological importance of disaccharides(sucrose, lactose, maltose, isomaltose, trehalose), trisaccharides (raffinose, melezitose), structuralpolysaccharides (cellulose, chitin, pectin) and storage polysaccharides (starch, inulin, glycogen).Glycosaminoglycans, Bacterial cell wall polysaccharides. Outlines of glycoproteins, glycolipids andblood group substances.

Unit – III: Lipids 12 hours

Lipids: Classification, saturated and unsaturated fatty acids, structure and properties of fats and oils(acid, saponificition and iodine values, rancidity). General properties and structures of phospholipids,sphingolipids and cholesterol and lipoproteins.

Biomembranes: Behavior of amphipathic lipids in water- formation of micelles, bilayers,vesicles,liposomes. Membrane composition and organization – Fluid mosaic model, transportation of ions (Active and passive transport).

Unit-IV: Amino Acids and Peptides 12 hours

Amino Acids: Classification, structure, stereochemistry, chemical reactions of amino acids due tocarbonyl and amino groups. Titration curve of glycine and p*K* values. Essential and non-essential aminoacids, non-protein amino acids. Peptide bond - nature and conformation. Naturally occurring peptides –glutathione, enkephalin.

Unit-V: Proteins 12 hours

Proteins: Classification based on solubility, shape and function. Determination of amino acid composition of proteins. General properties of proteins, denaturation and renaturation of proteins.Structural organization of proteins- primary, secondary, tertiary and quaternary structures (Eg.Hemoglobin and Myoglobin), forces stabilizing the structure of protein.

Practical : 19BC1P: Qualitative Analysis

List of Experiments:

1. Preparation of buffers (acidic, neutral and alkaline) and determination of *p*H.
2. Titration curve of glycine and determination of *p*K and *p*I values.
3. Qualitative identification of carbohydrates- glucose, fructose, ribose, maltose, sucrose, lactose, starch/glycogen.
4. Preparation of Osazones and their identification.
4. Qualitative identification of amino acids – Alanine, histidine, tyrosine, cysteine, glutamic acid.
5. Qualitative identification of lipids- solubility, saponification, acrolein test, Salkowski test, Acid number and Iodine number tests.

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II SEMESTER (w.e.f. 2019-20 Admitted Batch)

B.Sc. **BIO-CHEMISTRY**

60 hrs

(5 periods/week)

19BC2-Nucleic acids and Biochemical Techniques

Unit-I : Nucleic Acids 12 hours

Nature of nucleic acids. Structure of purines and pyrimidines, nucleosides, nucleotides. Stability and formation of phosphodiester linkages. Effect of acids, alkali and nucleases on DNA and RNA. Structure of Nucleic acids- Watson-Crick DNA double helix structure, introduction to circular DNA, super coiling, helix to random coil transition, denaturation of nucleic acids, hyperchromic
effect, *T*m-values and their significance. Reassociation kinetics, cot curves and their significance. Types of RNA and DNA.

Unit-II: Porphyrins 9 hours

Structure and types of porphyrins; Protoporphyrin, porphobilinogen properties Structure, properties & biological importance of metalloporphyrins – Heme, cytochromes and chlorophylls.

Unit-III: Biochemical Techniques I 15 hours

Methods of tissue homogenization: (Potter-Elvejham, mechnical blender, sonicator and enzymatic). Principle and applications of centrifugation techniques- differential, densitygradient. Ultracentrifugation- preparative and analytical.
Principle and applications of chromatographic techniques- paper, thin layer, gel filtration, ionexchangeand affinity chromatography.

Unit-IV: Biochemical Techniques II

Electrophoresis- principles and applications of paper, agarose gel electrophoresis and polyacrylamide (native and SDS) Elementary treatment of an enzyme purification.
Tracertechniques: Introduction to Radio activity Radio isotopes, units of radio activity, half life, β andγ- emitters, use of radioactive isotopes in biology

Unit-V: Biochemical Techniques III 12 hours

Spectrophotometry: Laws of light absorption- Beer-Lambert law, Instrumentation of UV and visible spectrophotometry and its Applications. Coloriemetry: Principles and its applications, Principle of fluorimetry

Practical 19BC2P- : Nucleic acids and Biochemical Techniques

List of Experiments:

1. Isolation of DNA from plants
2. Qualitative Identification of DNA,RNA and Nitrogen Bases
3. Isolation of egg albumin from egg white.
4. Isolation of cholesterol from egg yolk.
5. Isolation of starch from potatoes.
6. Isolation of casein from milk.
7. Separation of amino acids by paper chromatography.
8. Determination of exchange capacity of resin by titrimetry (Record with Demo)
9. Separation of proteins by Agarose electrophoresis.
10. Separation of plant pigments by TLC.

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III Semester Syllabus (w.e.f. 2019-20 Admitted Batch)

B.Sc. BIOCHEMISTRY

19BC3- Enzymology and Bioenergetics

Unit-I: Classification of Enzymes and Structure

Introduction to biocatalysis, differences between chemical and biological catalysis. Nomenclature and classification of enzymes. Enzyme specificity. Active site. Principles of energy of activation, transition state. Interaction between enzyme and substrate- lock and key, induced fit models. Definition of holoenzyme, apo-enzyme, coenzyme, cofactor. Fundamentals of enzyme assay, enzyme units.

Unit II: Influence of Physical factors and Inhibitors on Enzyme activity.

Factors affecting the catalysis- substrate concentration, *p*H, temperature. Michaelis - Menten equation for uni-substrate reaction (derivation not necessary), significance of *K*M and Vmax. Enzyme inhibition-irreversible and reversible, types of reversible inhibitions- competitive and non-competitive.

Unit-III: Mechanism of enzyme action

Outline of mechanism of enzyme action - acid-base catalysis, covalent catalysis, electrostatic catalysis,and metal ion catalysis. Regulation of enzyme activity- allosterism and cooperatitvity, ATCase as an allosteric enzyme, covalent modulation - covalent phosphorylation of phosphorylase, zymogen activation - activation of trypsinogen and chymotrypsinogen. Isoenzymes (LDH). Multienzyme complxes (PDH). Ribozyme .

Unit- IV: Bioenergetics

Bioenergetics: Thermodynamic principles – Chemical equilibria; free energy, enthalpy (H), entropy (S). Free energy change in biological transformations in living systems; High energy compounds. Energy, change, oxidation-reduction reactions.

Unit V : Biological Oxidations in Mitochondria

Organization of electron transport chain and enzyme complexes, inhibitors of electron transport. Oxidative phosphorylation. Uncouplers and inhibitors of oxidative phosphorylation. Mechanism of oxidative phosphorylation.

SEMESTER-3

Practical paper 19BC3P Enzymology
Minimum of FIVE experiments to be done and recorded

1. Assay of amylase
2. Assay of urease
3. Assay of catalase.
4. Assay of phosphatase
5. Determination of optimum temperature for amylase.
6. Determination of optimum *p*H for phosphatase.

Reference Books:

1. Fundamentals of Enzymology – Price.N.C.and Stevens.L., Oxford University Press.
2. Understanding Enzymes – Palmer.T., Ellis Harwood.
3. Enzymes – Biochemistry, Biotechnology, Clinical Chemistry – Palmer.T., Affiliated East-West Press.
4. Lehninger's Principles of Biochemistry – Nelson.D.L. and Cox.M.M., Freeman & Co.
5. Biochemistry – Berg.J.M., Tymoczko.J.L. and Stryer.L., Freeman & Co.
6. Biochemistry – Voet.D and Voet., J.G., John Wiley & Sons

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IV Semester Syllabus (w.e.f. 2019-20 Admitted Batch)

B.Sc. BIOCHEMISTRY

19BC4- Intermediary Metabolism

Unit- I : Carbohydrate Metabolism

Concept of anabolism and catabolism. Glycolytic pathway, energy yield.
Fate of pyruvateformation of lactate and ethanol, Pasteur effect. Citric acid cycle, regulation, energy yield, amphipathic role. Anaplerotic reactions. Glycogenolysis and glycogenesis. Pentose phosphatepathway. Gluconeogenesis. Photosytnthesis- Light and Dark reactions, Calvin cycle, C4 Pathway.

Unit- II : Lipid Metabolism

Catabolism of fatty acids (β- oxidation) with even and odd number of carbon atoms, Ketogenesis,de novo synthesis of fatty acids, elongation of fatty acids in mitochondria and microsomes,Biosynthesis and degradation of triacyl glycerol and lecithin. Biosynthesis of cholesterol.

Unit- III: Metabolism of Amino acids

General reactions of amino acid metabolism- transamination, decarboxylation and deamination, Urea cycle and regulation, Catabolism of carbon skeleton of amino acids- glycogenic and ketogenic amino acids. Metabolism of glycine, serine, aspartic acid, methionine, phenylalanine and leucine. Biosynthesis of creatine.

Unit- IV: Metabolism of Nucleic acid, heme

Biosynthesis and regulation of purine and pyrimidine nucleotides,de novo and salvage pathways. Catabolism of purines and pyrimidines. Biosynthesis of deoxyribonucleotides- ribonucleotide reductase and thymidylate synthase and their significance.Biosynthesis and degradation of heme.

Unit- V : Integration and Inborn Errors of Metabolism

Out lines of Metabolism, Integration of Major organs in metabolic pathway of carbohydrate, lipid. Protein metabolisms, Starvation. Disorders of carbohydrate Metabolism : hypoglycemias, hyperglycemia, glycosuria, renal threshold value. *Diabetes mellitus*-classification, glucose tolerance test (GTT), diabetic ketoacidosis. Disorders of Amino acid metabolism: Phenylketonuria, Alkaptonuria, Albinism, Maple syrup urine disease (MSUD).
Disorders of nucleotide metabolism- Gout, Lesch- Nyhan syndrome, Reye syndrome.
Disorders of Lipid Metabolism: lipoproteinemias,hyper cholesterolemia,atherosclerosis

Reference Books:

1. Lehninger's Principles of Biochemistry – Nelson.D.L. and Cox.M.M.,Freeman & Co.
2. Biochemistry – Berg.J.M., Tymoczko.J.L. and Stryer.L., Freeman & Co.
3. Biochemistry – Voet.D and Voet., J.G., John Wiley & Sons
4. Biochemistry-Lippincott's Illustrated Reviews. Champe, P.C. and Harvey, R.A. Lippincott
5. Fundamentals of Biochemistry –Jain, J.L., Jain, S., Jain, N. S. Chand & Co.
6. Biochemistry – Satyanarayana. U and Chakrapani. U, Books & Allied Pvt.Ltd.
7. Biochemistry – Rama Rao. A and Ratna Kumari. D, Kalyani Publishers.
8. Harpers -Biochemistry
9. Strayer – Biochemistry

SEMESTER-4

Practical paper 19BC4P - Quantitative Analysis
Minimum of FIVE experiments to be done and recorded

1. Estimation of amino acid by Ninhydrin method.
2. Estimation of protein by Biuret method.
3. Estimation of protein by Lowry method.
4. Estimation of glucose by DNS method.
5. Estimation of glucose by Benedict's titrimetric method.
6. Estimation of total carbohydrates by Anthrone method.