**Dr.V.S.KRISHNA GOVT. DEGREE & PG COLLEGE (A)**

**VISAKHAPATNAM**

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**BOARD OF STUDIES 2020-21**

**BIOCHEMISTRY**

**DEPARTMENT OF BIOCHEMISTRY**

**(SYLLABUS, MODEL PAPER, BLUE PRINT, CREDITS, LIST OF EXAMINERS)**

# Dr. V. S. KRISHNA GOVT. DEGREE COLLEGE (AUTONOMOUS)

**MADDILAPALEM, VISAKHAPATNAM**

## B.Sc BIOCHEMISTRY (CBCS) SYLLABUS (W.E.F 2020-2021) FIRST YEAR – SEMESTER- I

**COURSE – 1 BIOPHYSICAL CONCEPTS AND BIOMOLECULES-I**

 **TOTAL HOURS: 60 CREDITS: 4**

## Unit – I: Biophysical Concepts 12 hours

Role of water in biological processes. Biological relevance and measurement of pH, pKa of functional groups in biopolymers such as proteins and nucleic acids. Importance of buffers in biological systems. Donnan membrane equilibrium.

Units of measurements of solutes in solution, e.g. Normality, Molality, Molarity, Osmolarity, Ionic strength. Significance of Osmosis and osmotic pressure in biological systems. Examples of this concept. Isotonic solution, hyper and hypotonic solution.

## 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).

Structural polysaccharides (cellulose, chitin, pectin) and storage polysaccharides (starch, inulin, glycogen). Glycosaminoglycans, Bacterial cell wall polysaccharides. Outlines of glycoproteins, glycolipids and blood 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. Prostaglandins- structure and biological role of PGD2,PGE2 and PGF2 .

Biomembranes: Behavior of amphipathic lipids in water- formation of micelles, bilayers, vesicles, liposomes. Membrane composition and organization – Fluid mosaic model. Lipoproteins: Types and functions.

**Unit-IV: Amino Acids and Peptides 12 hours** Amino Acids: Classification, structure, stereochemistry; chemical reactions of amino acids due to carbonyl and amino groups. Titration curve of glycine and pK values. Non-protein amino acids.

Peptide bond - nature and conformation (Ramachandran plot). 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. Outlines of protein sequencing.

## Practical:1 Qualitative Analysis

**TOTAL HOURS: 30 CREDITS: 1**

## List of Experiments:

1. General safety procedures in a laboratory. Use of instruments and glassware.
2. Preparation of solutions for Normality, Molality, Molarity, percent solutions
3. Preparation of buffers (acidic, neutral and alkaline) and determination of pH.
4. Titration curve of glycine and determination of pK and pI values.
5. Qualitative identification of carbohydrates- glucose, fructose, ribose/xylose, maltose, sucrose, lactose, starch/glycogen.
6. Determination of optical activity of glucose using polarimeter.
7. Qualitative identification of amino acids – histidine, tyrosine, tryptophan, cysteine, arginine.
8. Qualitative identification of lipids- solubility, saponification, acrolein test, Salkowski test, Lieberman-Burchard test.
9. Proteins–Precipitation reactions of proteins.
10. Color reactions of proteins.

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## B.Sc BIOCHEMISTRY (CBCS) SYLLABUS (W.E.F 2020-2021) FIRST YEAR – SEMESTER- II

**COURSE – 2 BIOMOLECULES-II AND ENZYMOLOGY**

**TOTAL HOURS: 60 CREDITS: 4**

## Unit-I: Nucleic Acids 12 hours

Nature of nucleic acids. Structure of purines and pyrimidines, nucleosides, nucleotides. Stability and formation of phosphodiester linkages. Structure of Nucleic acids- Watson-Crick DNA double helix structure. Introduction to circular DNA, super coiling, helix to random coil transition.

Effect of acids, alkali and nucleases on DNA and RNA. denaturation of nucleic acids- hyperchromic effect, Tm-values and their significance. Reassociation kinetics, cot curves and their significance. Types of RNA and DNA.

## Unit-II: Porphyrins 12 hours

Structure of porphyrins; Protoporphyrin, porphobilinogen- properties. Identification of Porphyrins.

Structure of metalloporphyrins – Heme, cytochromes and chlorophylls.

## Unit-III: Classification of Enzymes and Structure 12 hours

Introduction to biocatalysis (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 holo-enzyme, apo-enzyme, coenzyme, cofactor. Fundamentals of enzyme assay, enzyme units.

## Unit IV: Influence of Physical factors and Inhibitors on Enzyme activity. 12 hours

Factors affecting the catalysis- substrate concentration, pH, temperature. Michaelis - Menten equation for uni-substrate reaction (derivation not necessary), significance of KM and Vmax.

Enzyme inhibition- irreversible and reversible, types of reversible inhibitions- competitive and non-competitive.

## Unit-V: Mechanism of enzyme action 12 hours

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 complexes (PDH). Ribozyme.

## Practical- 2: BIOMOLECULES-II AND ENZYMOLOGY

**TOTAL HOURS: 30 CREDITS: 1**

## List of Experiments:

1. Qualitative Identification of DNA, RNA and Nitrogen Bases.
2. Determination of Tm of DNA. Calculate the value of Tm of DNA.
3. Assay of enzyme activity and specific activity of alkaline phosphatases.
4. Determination of optimum pH for phosphatase.
5. Assay of amylase.
6. Assay of urease
7. Assay of catalase.
8. Determination of optimum temperature for amylase.
9. Determination of Km and Vmax of salivary enzyme.

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## B.Sc BIOCHEMISTRY (CBCS) SYLLABUS (W.E.F 2020-2021) SECOND YEAR – SEMESTER- III

**COURSE – 3 BIOENERGETICS AND BIOPHYSICAL TECHNIQUES**

**TOTAL HOURS: 60 CREDITS: 4**

**Unit- I: Bioenergetics 12 hours**

Thermodynamic principles – Chemical equilibria; free energy, enthalpy (H), entropy (S). Free energy change in biological transformations in living systems.

High energy compounds. Oxidation-reduction reactions. Reduction potential. Substrate level phosphorylation. Concept of anabolism and catabolism.

## Unit II : Biological Oxidations in Mitochondria 12 hours

Organization of electron carriers and enzymes in mitochondria. Classes of electron- transferring enzymes, inhibitors of electron transport.

Oxidative phosphorylation. Uncouplers and inhibitors of oxidative phosphorylation. Mechanism of oxidative phosphorylation.

## Unit-III: Biochemical Techniques I 12 hours

Methods of tissue homogenization: (Potter-Elveham, mechanical blender, sonicator and enzymatic). Principle and applications of centrifugation techniques- differential, density gradient. Ultra-centrifugation- preparative and analytical.

Principle and applications of chromatographic techniques- paper, thin layer, gel filtration, ion

* exchange and affinity chromatography. High-Performance Liquid Chromatography (HPLC). **Unit-IV: Biochemical Techniques II 12 hours**

Electrophoresis- principles and applications of paper, polyacrylamide (native and SDS) and agarose gel electrophoresis. Elementary treatment of enzyme purification.

Colorimetry and Spectrophotometry- Laws of light absorption- Beer-Lambert law. UV and visible absorption spectra, molar extinction coefficient, biochemical applications of spectrophotometer. Principle of fluorimetry.

## Unit- V: Techniques employed in metabolic studies and tracer techniques

**12 hours**

Broad outlines of Intermediary metabolism, Methods of investigation. Homogenates and purified enzyme systems, use of inhibitors and antimetabolites.

Tracer techniques: Radio isotopes, units of radio activity, half life, β and γ- emitters, use of radioactive isotopes in biology.

## Practical –3 BIOENERGETICS AND BIOPHYSICAL TECHNIQUES

**TOTAL HOURS: 30 CREDITS: 1**

## List of Experiments:

* 1. Determination of Critical Micelle concentration of detergents.
	2. Separation of amino acids by paper chromatography.
	3. Separation of serum proteins by paper electrophoresis.
	4. Separation of plant pigments by TLC.
	5. SDS-PAGE analysis of proteins.
	6. Determination of extinction coefficient of different BSA solutions by spectrophotometers.
	7. Isolation of
		1. Egg albumin from egg white.
		2. Cholesterol from egg yolk.
		3. Starch from potatoes.
		4. Casein from milk.
		5. Mitochondria from liver.

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## B.Sc BIOCHEMISTRY (CBCS) SYLLABUS (W.E.F 2020-2021) SECOND YEAR – SEMESTER- IV

**COURSE – 4 INTERMEDIARY METABOLISM AND NUTRITION**

**TOTAL HOURS: 60 CREDITS: 4**

**Unit- I: Carbohydrate Metabolism 12 hours**

Glycolytic pathway, energy yield. Fate of pyruvate- formation of lactate and ethanol, Pasteur Effect. Citric acid cycle, regulation, energy yield, amphipathic role. Anaplerotic reactions.

Glycogenolysis and glycogenesis. Pentose phosphate pathway. Gluconeogenesis.

Photosytnthesis- Light (cyclic and non-cyclic photophosphorylation) and Dark reactions (Calvin cycle, C4 Pathway). Disorders of carbohydrate metabolism.

## Unit- II: Lipid Metabolism 12 hours

Catabolism of fatty acids (β- oxidation) with even and odd number of carbon atoms, Ketogenesis, de novosynthesis of fatty acids, elongation of fatty acids in mitochondria and microsomes.

Biosynthesis and degradation of triacylglycerol and lecithin. Biosynthesis of cholesterol. Disorders of lipid metabolism.

## Unit- III: Metabolism of Amino acids 12 hours

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. Inborn errors of aromatic and branched chain amino acid metabolism.

## Unit- IV: Metabolism of Nucleic acids and heme: 12 hours

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. Disorders of nucleotide metabolism- Gout, Lesch- Nyhan syndrome.

Biosynthesis and degradation of heme.

## Unit- V: Nutritional Biochemistry 12 hours

Balanced diet. Calorific values of foods and their determination by bomb calorimeter. BMR and factors affecting it. Specific dynamic action of foods. Energy requirements and recommended dietary allowance (RDA) for children, adults. Sources of complete and incomplete proteins. Biological value of proteins. Malnutrition- Kwashiorkor, Marasmus and PEM.

Vitamins- sources, structure, biochemical roles, deficiency disorders of water and fat soluble vitamins. Introduction to neutraceutical and functional foods. Bulk and trace elements-Ca, Mg, Fe, I, Cu, Mo, Zn, Se and F. Obesity and starvation.

## Practical –4: QUANTITATIVE ANALYSIS, METABOLISM AND NUTRITION

**TOTAL HOURS: 30 CREDITS: 1**

## List of Experiments:

1. Estimation of amino acid by Ninhydrin method.
2. Estimation of protein by Biuret method / Lowry method.
3. Estimation of glucose by DNS method.
4. Estimation of glucose by Benedict’s titrimetric method.
5. Estimation of total carbohydrates by Anthrone method.
6. Estimation of DNA by diphenylamine method and RNA by orcinol method.
7. Assay of serum transaminases-SGOT, SGPT.
8. Estimation of serum uric acid and serum creatinine
9. Estimation of calcium in raagi.
10. Estimation of iron by Wong’s method.
11. Estimation of vitamin C by 2, 6 -dichlorophenol indophenol method.
12. Determination of iodine value of oil.

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## B.Sc BIOCHEMISTRY (CBCS) SYLLABUS (W.E.F 2020-2021) SECOND YEAR – SEMESTER- IV

**COURSE– 5 MOLECULAR BIOLOGY AND MICROBIOLOGY**

## TOTAL HOURS: 60 CREDITS: 3

**Unit- I : DNA Replication and Transcription 12 hours**

Nature and structure of the gene. DNA replication- models of replication, Meselson-Stahl’s experimental proof for semi-conservative model. DNA polymerases I, II and III of E.coli, helicase, topoisomerases, primase, ligase. Bidirectional replication model. Okazaki fragments, leading and lagging strands of DNA synthesis. Inhibitors of DNA replication.

Transcription - RNA synthesis, RNA polymerases of prokaryotes and eukaryotes. Promoters, Initiation- sigma factors and their recognition sites. Elongation- role of core enzyme. Termination- rho dependent and rho independent. Post- trancriptional modifications.

## Unit II- Protein Synthesis and Regulation of Gene Expression 12 hours

Introduction to protein synthesis- Genetic code, deciphering of genetic code, Nirenberg’s and Khorana’s experiments, wobble hypothesis, degeneracy of genetic code.

Protein synthesis- activation of amino acids (aminoacyl t-RNA synthetases). Initiation, elongation and termination of protein synthesis. Post- translational modifications- signal hypothesis. Inhibitors of protein synthesis.

Regulation of prokaryotic gene expression- induction and repression. Lac operon. **Unit- III : Recombinant DNA technology 12 hours**

Outlines of cloning strategies.DNA sequencing- Maxam Gilbert and Sanger’s methods. Tools of r-DNA technology: Enzymes- Restriction endonucleases, ligase, phosphatases, reverse transcriptase, polynucleotide kinases, terminal transferase nucleases-S1 and RNAase H. Restriction mapping. Cloning vectors- Plasmid, Expression vector - Host- E.coli.

Construction of c-DNA and genomic libraries. Isolation and sequencing of cloned genes- colony hybridization, nucleic acid hybridization. Polymerase chain reaction- principle and applications. Outlines of blotting techniques-Southern, Northern and Western.

Applications of gene cloning- production of insulin and human growth hormone, production of Bt cotton and edible vaccines.

## Unit- IV: Microbiology 12 hours

Classification of microorganisms- prokaryotic and eukaryotic microorganisms. Isolation and cultivation of bacteria. Selective media and enriched media. Bacterial growth curve and kinetics of growth. Gram’s staining- Gram positive and Gram negative bacteria, motility and sporulation.

Structure and composition of viruses. Isolation and cultivation of bacterial plaques. Lytic and lysogenic life cycle of λ phage. Retro viruses- HIV.

**Unit- V: Infectious agents and their associated diseases 12 hours** Source, reservoir and transmission of pathogens, Antigenic shift and antigenic drift. Host parasite relationship, types of infections associated with parasitic organisms. Overview of viral and bacterial pathogenesis. Infection and evasion.

Viral infection (polio, measles, mumps, influenza, HIV); Bacterial infections (tetanus, diphtheria, tuberculosis, typhoid, cholera); Protozoan (Plasmodium and Trypanosoma) and parasitic infections.

##  Practical: 5 Microbiology and Molecular Biology

**TOTAL HOURS: 30 CREDITS: 1**

**List of Experiments:**

1. Preparation of culture media and sterilization methods.
2. Isolation of pure cultures: (i) Streak plate method. (ii) Serial dilution method.
3. Gram staining.
4. Motility of bacteria by hanging drop method.
5. Antibiotic sensitivity by paper disc method.
6. Isolation of DNA from onion/liver/coconut endosperm.
7. Perform Southern Blot Hybridization (Restrict DNA for Southern Blot electrophoresis, perform electrophoresis of restricted DNA, perform southern transfer, hybridization and detection of gene of interest)
8. Isolation of Plasmid DNA
9. Restriction enzyme digestion of plasmid DNA and size estimation of fragments.
10. Demonstration of PCR technique.

## Recommended Books for Biochemistry

**General Biochemistry**

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. Textbook of Biochemistry – West.E.S.,Todd.W.R,Mason.H.S..and. Bruggen, J.T.V., Oxford & IBH Publishers.
5. Principles of Biochemistry: General Aspects-Smith, E. L., Hill, R.L. Lehman, I.

R. Lefkowitz, R.J. Handler, P., and White, A. McGraw-Hill

1. Outlines of Biochemistry – Conn.E.E.,Stumpf.P.K., Bruening, G and Doi.R.H., John Wiley & Sons .
2. Harper’s Illustrated Biochemistry – Murray, R.K., Granner.D.K. & Rodwell,V.W., McGraw-Hill 8. Bichemistry-Lippincott’s Illustrated Reviews. Champe, P.C. and Harvey, R. A. Lippincott
3. Fundamentals of Biochemistry –Jain, J.L., Jain, S., Jain, N. S. Chand & Co.
4. Biochemistry – Satyanarayana. U and Chakrapani. U, Books & Allied Pvt. Ltd.
5. Biochemistry – Rama Rao. A and Ratna Kumari. D, Kalyani Publishers.
6. Biochemistry- The Molecular Basis of Life – McKee. T and McKee, J. R, McGraw-Hill.

## Enzymology

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

## Biochemical Techniques

1. Principles and Techniques of Practical Biochemistry- Wilson, K. and Walker, J. Cambridge Press.
2. The Tools of Biochemistry- Cooper, T. G. John Wiley & Sons Press.
3. Physical Biochemistry- Friefelder, D. W.H. Freeman Press.
4. Analytical Biochemistry – Holme.D.J. and Peck.H., Longman.
5. Biophysical Chemistry: Principle and techniques- Upadhyay A, Upadhyay K and Nath. N. Himalaya Publishing House.
6. Experimental Biochemistry- Clark Jr. J.M and Switzer, R. L. Freeman & Co..

## Physiology, Nutrition and Clinical Biochemistry:

1. Textbook of Biochemistry and Human Biology – Talwar, G.P. and Srivastava. L.M., Printice Hall of India
2. Review of Medical Physiology-Ganong. McGraw-Hill.
3. Human Physiology – Chatterjee.C.C, Medical Allied Agency
4. Textbook of Medical Physiology – Guyton.A.G and Hall.J.E., Saunders
5. William’s Textbook of Endocrinology – Larsen, R. P. Korenberg, H. N. Melmed,

S. and Polensky, K. S. Saunders

1. Mammalian Biochemistry- White, A. Handler, P. and Smith, E. L. McGraw-Hill.
2. Textbook of Human Nutrition- Bamji, Pralhad Rao and Reddy V. Oxford & IBH Publishers.
3. Foods: Facts & Principle- Shakuntala and Shadaksharaswamy. Wiley Ester Press.
4. Essentials of Food and Nutrition – Swaminathan.M. Bangalore Press.
5. Human Nutrition and Dietetics. Davidson, S. and Passmore, J. R. ELBS.
6. A Textbook of Biochemistry: Molecular and Clinical Aspects. Nagini, S. Scitech Publishers.
7. Tietz Fundamentals of Clinical Chemistry- Burtis, A. A. and Ashwood, E. R. Saunders-imprint Elsevier Pub.
8. Textbook of Biochemistry with Clinical Correlations – Devlin.T.M.,Wiley – Liss
9. Textbook of Medical Biochemistry – Chatterjea.M.N. and Shinde.R, Jaypee Brothers Medical Publishers.
10. Textbook of Medical Biochemistry- Ramakrishnan, S., Prasannan, K. G. and Rajan, R. Orient Longman

## Immunology:

1. Immunology. Tizard, I. R. Thomson Press.
2. Kuby Immunology – Kindt.T.J., Goldsby.R.A. and Osborne.B.A., Freeman & Co.
3. Roitt’s Essential Immunology – Roitt.I.M. and Delves.P.J., Blackwell Science.
4. Immune system- Parham. Garland Publishing.

## Microbiology:

1. Introduction to Microbiology: A Case History Approach- Ingraham and Ingraham. Thomson Press.
2. Textbook of Microbiology – Ananthanarayan, R and Jayaram Paniker, C.K., Orient Longman.
3. Microbiology – Prescott.L.M.,Harley.J.P. & Klein.D.A, McGraw-Hill.
4. Microbiology: An Introduction- Tortora, G. J. Funke, B. R. and Case, C. L., Pearson-Benjamin-Cummings Co.
5. Microbiology – Pelczar Jr,.M.J., Chan.E.C.S. and Krieg.N.R., Tata McGraw-Hill.
6. Textbook of Microbiology- Dubey, R. C. and Maheshwari, D. K. S. Chand & Co.

## Molecular Biology and Biotechnolgy:

1. Protein Biochemistry & Biotechnology- Walsh. John Wiley & Sons Press.
2. Molecular Biology of Cell- Alberts, B. Bray, D. Lewis, J. Raff, M. Roberts, K. and Watson, J. D. Garland Publishing.
3. Recombinant DNA and Biotechnology: A Guide for teachers- Helen and Massey. ASM Press.
4. Genes VIII – Lewin. B, Oxford University Press .
5. Molecular Biology- Freifelder. D. Naroasa Pub. House
6. Molecular Biology of the Gene- Watson. J.D., Baker, T.A, Bell, S.P.,Gann.A, Levine, M. and Losick.R, Pearson Education.
7. Molecular Biotechnology- Glick, B. R. and Pasternak, J. J. ASM Press
8. Principles of Gene Manipulation: An Introduction to GE- Old, R. V. and Primrose, S. B. Blackwell Sci. Pub.
9. A Textbook of Biotechnology-Dubey, R. C. S. Chand & Co.
10. Gene Biotechnology- Jogdand. Himalaya Pub. House.
11. Introduction to Biotechnology: An Agricultural Revolution-Herren. Thomson Press.
12. Molecular Cell Biology- Lodish, H., Berk, A., Matsudaira, P., Kaiser, C. A., Krieger, M. Scott M. P., Zipursky, S. L. and Darnell, J. Freeman & Co.

## Bioinformatics

1. Instant Notes-Bioinformatics- Westhead et al., Viva Books (P), Ltd
2. Introduction to Bioinformatics- Attwood T K and Parry-Smith, D. J. Pearson Education.
3. Introduction to Bioinformatics- Lesk, A.M. Oxford University Press

## Practical Biochemistry:

1. Experimental Biochemistry: A Student companion- Sashidhar Rao, B and Deshpande, V. IK International (P) Ltd. Pub.
2. Modern Experimental Biochemistry- Boyer. R. Pearson Education
3. Biochemical Methods –Sadasivam, S and Manickyam, A.- New Age International publishers
4. An Introduction to Practical Biochemistry- Plummer, D. T. Tata McGraw-Hill.
5. Introductory Practical Biochemistry (ed) Sawhney, S. K. Randhir Singh- Narosa Publications House
6. Lab Manual in Biochemistry, Immunology and Biotechnology- Arti Nigam and Archana Ayyagari- Tata McGraw-Hill New Delhi
7. Enzyme Assays – A Practical Approach – Eisenthal,.R and Dawson, M.J., IRL Press
8. Practical Biochemistry – Rameshwar. A, Kalyani Publisher.
9. Experiments and Techniques in Biochemistry – Sheel Sharma, Galgotia Publications.
10. Practical Clinical Biochemistry-Varley,H. CBS Publishers.
11. Practical Clinical Biochemistry –Methods and Interpretations –Ranjna Chawla- Jaypee
12. Manipal Manual of Clinical Biochemistry-Shivande Naik, B - Jaypee Brother Medical publications, New Delhi
13. Hawk’s Physiological Chemistry- (ed) Oser, O. Tata-McGraw-Hill
14. Laboratory Manual in Biochemistry. Jayaraman, J. Wiley-Eastern
15. Biotechnology: A laboratory Project in Molecular Biology- Thiel, Bissen and Lyons. Tata McGraw-Hill.
16. Methods in Biotechnology- Hans-Peter Schmauder. Taylor & Francis.

## Practical Microbiology:

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

## Mathematical Problems in General Biochemistry:

1. Biochemical Calculations- Segel, I.H. John Wiley & Sons.

## Lab Reference Book:

1. Lab Ref A Hand book of Recipes, Reagents and Other Reference Tools for Use at the Bench- (ed) Roskams, J. and Rodgers, L.- I.K International Pvt. Ltd, New Delhi.

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**B.Sc. BIOCHEMISTRY (CBCS) FIRST YEAR – SEMESTER- I (W.E.F 2020 - 21)**

**COURSE– 1 BIOPHYSICAL CONCEPTS AND BIOMOLECULES**

**Model paper**

 **Max.marks: 75 Time: 3hrs**

 **SECTION –A** 5x10 = 50M

Answer **ALL** questions (Draw the diagrams wherever necessary)

1a) Describe the Water as a biological solvent and its role in biological processes.

 Or

1b) Explain the Significance of osmotic pressure in biological systems.

2a) Explain the reactions of carbohydrates (due to functional groups - hydroxyl, aldehyde and

 Ketone).

Or

2b) Define GAG’s. Explain its classification.

3a) Describe the structure & biological role of Prostaglandins.

Or

3b) Describe the membrane composition and organization- Fluid Mosaic Model.

4a) Describe the chemical reactions of amino acids due to carbonyl and amino groups.

Or

4b) Define peptide bond- its nature and conformation.

5a) Determine the general properties of proteins

Or

5b) Explain the structural organization of proteins.

 **SECTION –B** 5X5=25 Marks

Answer any **FIVE** questions (Draw the diagrams wherever necessary)

6. Oxygen electrode.

7. Lactose.

8. Glycoproteins & Glycolipids.

9. General properties and structure of cholesterol.

10. Formation of micelles.

11. Essential & Non- Essential aminoacids.

12. Glutathione.

13. Forces stabilizing the structure of protein.

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**B.Sc. BIOCHEMISTRY (CBCS) FIRST YEAR – SEMESTER- I (W.E.F 2020 - 21)**

**COURSE– 1 BIOPHYSICAL CONCEPTS AND BIOMOLECULES**

**BLUE PRINT FOR QUESTION PAPER SETTER**

|  |  |  |  |
| --- | --- | --- | --- |
| **Units** | **10 M questions** | **5 M questions** | **Marks allotted to the unit** |
| Unit 1 | 2 | 01 | 25 |
| Unit 2 | 2 | 02 | 30 |
| Unit 3 | 2 | 02 | 30 |
| Unit 4 | 2 | 02 | 30 |
| Unit 5 | 2 | 01 | 25 |
| Total no. of questions | 10 | 8 | 140 |

**NOTE :**

1. The Question paper setters are requested to kindly adhere to the format given in the above table.

2. The Question paper setters are also requested to set the questions in the following way:

a. 80% of questions – memory and understanding based.

b. 20% of questions – Creativity, application and skill based.

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**B.Sc. BIOCHEMISTRY (CBCS) FIRST YEAR – SEMESTER- II (W.E.F 2020 - 21)**

**COURSE – 2 BIOMOLECULES –II AND ENZYMOLOGY**

**Model paper**

**Max.marks: 75 Time: 3hrs**

 **SECTION –A** 5x10=50M

Answer **ALL** questions (Draw the diagrams wherever necessary)

1a) Describe the secondary structure of DNA with a labeled diagram

 Or

1b) Explain the Cot curves and their significance.

2a) Explain the Structure and identification of Porphyrins.

Or

2b) Explain the Structure and properties of Cytochromes.

3a) Describe the Principle & Applications of Centrifugation techniques- differential, density gradient.

 Or

3b) Describe the Elementary Treatment of Enzyme Purification.

4a) Describe the Principle & Instrumentation of UV- Spectrophotometry.

Or

4b) What are Radio isotopes? Mention the uses of radioactive isotopes in biology.

5a) Give broad outlines of Intermediary Metabolism.

Or

5b) Describe the isotope tracer studies.

 **SECTION –B** 5X5=25 Marks

Answer any **FIVE** questions (Draw the diagrams wherever necessary)

6. Phosphodiester Bond.

7. Super coiling.

8. Porphobilinogen.

9. Methods of Tissue Homogenization.

10. Agarose Gel Electrophoresis

11. Principle of Fluorimetry.

12. Radioisotopes & units of radioactivity.

 13. Use of Antimetabolites.

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**MADDILAPALEM, VISAKHAPATNAM**

**B.Sc. BIOCHEMISTRY (CBCS) FIRST YEAR – SEMESTER- II (W.E.F 2020 - 21)**

**COURSE– 2 BIOMOLOCULES-II AND ENZYMOLOGY**

**BLUE PRINT FOR QUESTION PAPER SETTER**

|  |  |  |  |
| --- | --- | --- | --- |
| **Units** | **10 M questions** | **5 M questions** | **Marks allotted to the unit** |
| Unit 1 | 2 | 02 | 30 |
| Unit 2 | 2 | 01 | 25 |
| Unit 3 | 2 | 02 | 30 |
| Unit 4 | 2 | 02 | 30 |
| Unit 5 | 2 | 01 | 25 |
| Total no. of questions | 10 | 8 | 140 |

**NOTE :**

1. The Question paper setters are requested to kindly adhere to the format given in the above table.

2. The Question paper setters are also requested to set the questions in the following way:

 a. 80% of questions – memory and understanding based.

 b. 20% of questions – Creativity, application and skill based.

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**B.Sc. BIOCHEMISTRY (CBCS) SECOND YEAR – SEMESTER- III (W.E.F 2020 - 21)**

**COURSE – 3 BIOENERGETICS AND BIOPHYSICAL TECHNIQUES**

**Model paper**

**Max marks: 75 Time: 3hrs**

 **SECTION –A** 5x10=50M

Answer **ALL** questions (Draw the diagrams wherever necessary)

1a) Explain Nomenclature & Classification of Enzymes.

 Or

1b) Describe Interactions between Enzyme & Substrate.

2a) Explain the factors affecting the Catalysis.

Or

2b) What is Enzyme inhibition. Explain the types of reversible inhibitions.

 3a) Describe the Acid-Base Catalysis with an example.

 Or

 3b) What are multi enzyme complexes? Give an example.

 4a) Explain the Thermodynamic Principles.

Or

 4b) What are High energy compounds?

 5a) Describe the Organization of electron carriers and enzymes in mitochondria.

Or

 5b) Explain the Mechanism of oxidative phosphorylation.

 **SECTION –B** 5X5=25 Marks

Answer any **FIVE** questions (Draw the diagrams wherever necessary)

6. Active site.

7. Definition of Holo-Enzyme & Apoenzyme.

8. Michaelis-Menton equation.

9. ATCase.

10. Zymogen activation.

11. Enthalpy& Entropy.

12. Oxidation-Reduction reactions.

 13. Inhibitors of ETC.

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**B.Sc. BIOCHEMISTRY (CBCS) SECOND YEAR – SEMESTER- III (W.E.F 2020 - 21)**

**COURSE – 3 BIOENERGETICS AND BIOPHYSICAL TECHNIQUES**

**BLUE PRINT FOR QUESTION PAPER SETTER**

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**MADDILAPALEM, VISAKHAPATNAM**

**B.Sc. BIOCHEMISTRY (CBCS) SECOND YEAR – SEMESTER- IV (W.E.F 2020 - 21)**

**COURSE – 4 INTERMEDIARY METABOLISM AND NUTRITION**

**Model paper**

**Max marks: 75 Time: 3hrs**

 **SECTION –A** 5x10=50M

Answer **ALL** questions (Draw the diagrams wherever necessary)

1a) Explain Citric acid cycle and its regulation.

 Or

1b) Define Photosynthesis. Explain the Light reactions.

2a) Explain the denovo synthesis of fatty acids.

Or

2b) Explain the biosynthesis & degradation of triacylglycerol.

3a) Explain the urea cycle and its regulation.

 Or

3b) Explain the Inborn errors of branched chain amino acids.

4a) Explain Biological nitrogen fixation.

Or

4b) Explain the synthesis of glutamine and regulatory mechanism of glutamine synthesis.

5a) Describe the Biosynthesis of purine nucleotides.

Or

5b) Explain the biosynthesis of Heme.

 **SECTION –B** 5X5=25 Marks

Answer any **FIVE** questions (Draw the diagrams wherever necessary)

6. Pasteur effect.

7. Diabetes Mellitus.

8. Catabolism of fatty acids (β- oxidation) with odd number of carbon atoms.

9. Transamination.

10. Metabolism of methionine.

11. Nitrogenase system.

12. Significance of thymidylate synthase.

 13. Gout.

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**B.Sc. BIOCHEMISTRY (CBCS) SECOND YEAR – SEMESTER- IV (W.E.F 2020 - 21)**

**COURSE – 4 INTERMEDIARY METABOLISM AND NUTRITION**

**BLUE PRINT FOR QUESTION PAPER SETTER**

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**MADDILAPALEM, VISAKHAPATNAM**

**B.Sc. BIOCHEMISTRY (CBCS) SECOND YEAR – SEMESTER- IV (W.E.F 2020 - 21)**

**COURSE – 5 MICROBIOLOGY AND MOLECULAR BIOLOGY**

**Model paper**

**Max marks: 75 Time: 3hrs**

 **SECTION –A** 5x10=50M

Answer **ALL** questions (Draw the diagrams wherever necessary)

1a) Explain the techniques of Isolation and cultivation of bacteria.

 Or

1b) Explain Lytic and lysogenic life cycle of λ phage.

2a) Explain the Industrial Production of Citric Acid.

Or

2b) Explain the Immobilization of enzymes and cells & different methods.

 3a) Explain the Meselson-Stahl’s experimental proof for semi-conservative model.

 Or

 3b) Explain the Transcription - RNA synthesis in Prokaryotes.

 4a) What is Genetic code? Explain the deciphering of genetic code & degeneracy of genetic code.

 Or

 4b) Explain the Regulation of prokaryotic gene expression- induction and repression.

 5a) Explain the Construction of c-DNA libraries.

Or

 5b) Write about Applications of gene cloning.

 **SECTION –B** 5X5=25 Marks

Answer any **FIVE** questions (Draw the diagrams wherever necessary)

6. Differentiate Selective media and Enriched media.

7. Principle types of fermenters.

8. BLAST.

9. DNA polymerases I, II and III of *E.coli*.

10. Activation of amino acids (aminoacyl t-RNA synthetases).

11. Lac operon.

12. Restriction endonucleases.

 13. Southern blotting technique.

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**B.Sc. BIOCHEMISTRY (CBCS) SECOND YEAR – SEMESTER- IV (W.E.F 2020 - 21)**

**COURSE – 5 MICROBIOLOGY AND MOLECULAR BIOLOGY**

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