PROPOSED SCHEME FOR CHOICE BASED CREDIT SYSTEM IN
B.Sc., BIOCHEMISTRY

<table>
<thead>
<tr>
<th>Code</th>
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### THIRD YEAR - SEMESTER V

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### SEMESTER VI

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TOTAL CREDITS: **164**

- CC - Core Course
- AECC - Ability Enhancement Compulsory Course
- DSC - Discipline Specific Core
- SEC - Skill Enhancement Course
- DSE - Discipline Specific Elective
- GE - Generic Elective
- HPW – Hours per week
Credit- I: Introduction

1. Scope of biochemistry
2. Water as biological solvent
3. Weak acids and bases
4. pH, buffers,
5. Biological Buffers
6. Henderson- Hasselbalch equation (Simple numerical problems)
7. Stereo chemistry with reference to carbohydrates & amino acids.

Credit - II: Carbohydrates

1. Classification of carbohydrates
2. Mono saccharide straight chain and ring structures
3. Reactions of monosaccharides, mutarotation
4. Amino sugars and glycosides
5. Disaccharides, oligosaccharides& polysaccharides
6. Storage and structural polysaccharides, glycosaminoglycan’s and
7. Bacterial cell wall polysaccharides.

Credit - III: Lipids

1. Classification of lipids
2. Essential fatty acids
3. Reactions & properties of lipids
4. General properties and structures of neutral fats, waxes, phospholipids, sphingolipids, cholesterol, glycolipids.
5. Prostaglandins and lipoproteins.
6. Bio membranes, behavior of amphipathic lipids in water, formation of micelles, bilayers, vesicles
7. Membrane composition and fluid mosaic model.

Credit – IV: Amino acids & proteins

1. Classification, structure, stereochemistry and chemical reactions of amino acids.
2. Titration curve of glycine &pk values.
7. Determination of amino acid composition of proteins.
References:

DSC – 1A  
Semester – I: Paper-BS 104 (practical): Qualitative Analysis of Biomolecules  
(1 Credits; 2 Hr/week)

1. Laboratory general safety procedures  
2. Preparation of standard solutions  
3. Determination of pKa values of amino acids by titration  
4. Preparation of buffers  
5. Qualitative identification of Carbohydrates  
6. Qualitative identification of Amino acids  
7. Qualitative identification of Lipids

References

2. Laboratory Manual in Biochemistry- Jayaraman, J. Wiley Eastern
Model paper: Theory
Duration 3 hours           Max. Marks 80

Section - A (Short Answer Type)
Answer all Questions       8 x 4 = 32 Marks
1.
2.
3.
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5.
6.
7.
8.

Section - B (Essay Answer Type)
Answer all Questions       4 x 12 = 48 Marks

9. (A). (OR)
    (B)

10. (A) (OR)
    (B)

11. (A) (OR)
    (B)

12. (A) (OR)
    (B)
# Model Paper Practicals (end of semester)

**Duration 3 hours**

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<thead>
<tr>
<th>Description</th>
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<tr>
<td>1. Write the Principles for the following experiments</td>
<td>5 Marks</td>
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<tr>
<td>2. Major Experiment</td>
<td>10 Marks</td>
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<tr>
<td>3. Minor Experiment</td>
<td>5 Marks</td>
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<tr>
<td>4. Viva-Voce and Record</td>
<td>5 Marks</td>
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DSC – 1B
Semester – II: Paper-BS 204 (Theory) Chemistry of Nucleic Acids and Biochemical Techniques
(4 Credits; 4 Hr/week)

Credit - I: Composition of Nucleic acids

2. Structure of purines and pyrimidines.
3. Nucleosides and Nucleotides
4. DNA & RNA.
5. Stability and formation of phosphodiester linkages
6. Effect of acids, alkali and nucleases and phosphodiester linkages
7. Photochemical and Spectral characteristics of Nucleic acid.

Credit - II: Structure of nucleic acids

1. Watson& Crick DNA double helix structure.
2. Introduction to circular DNA, supercoiling, helix to random coil transition,
3. denaturation of nucleic acids.
4. Hyper chromic effect
5. Tm values and their significance.
6. Reassociation kinetics, cot curves and their significance.
7. Different types of RNA and their biological functions.

Credit - III: Spectrophotometric and Centrifugation Techniques

1. Colorimetry and spectrophotometry.
3. UV spectra
4. Visible spectra
5. Molar extinction coefficient.
6. Principle of fluorimetry
7. Principle and applications of Centrifugation technique in biology

Credit – IV: Chromatography techniques

1. Principle in chromatographic technique.
2. Application of chromatographic technique in paper chromatography
3. TLC
4. Gel filtration (molecular sieve)
5. Ion exchange Chromatography
6. Affinity chromatography.
References

5. The Tools of Biochemistry- Cooper, T. G. John Wiley & Sons Press.
DSC – 1B
Semester – II: Paper-BS 204 (practical): Quantitative Analysis of Biomolecules
(1 Credits; 2 Hr/week)

1. Amino acid Estimation by Ninhydrin method
2. Protein Estimation by Folin`s Method
3. Total Sugar Estimation by Anthrone Method
4. Total Reducing Sugar Estimation by Dinitrosalicylate
5. Estimation of Keto sugar by Roe’s resorcinol Method

References

2. Laboratory Manual in Biochemistry- Jayaraman, J. Wiley Eastern
Model paper: Theory
Duration 3 hours           Max. Marks 80

Section - A (Short Answer Type)
Answer all Questions        8 x 4 = 32 Marks

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Section - B (Essay Answer Type)
Answer all Questions   4 x 12 = 48 Marks

9. (A).  (OR)
   (B) 

10. (A)  (OR)
    (B) 

11. (A)  (OR)
    (B) 

12. (A)  (OR)
    (B)
# Model Paper Practicals (end of semester)

**Duration** 3 hours  
**Max. Marks** 25

1. Write the Principles for the following experiments  5 Marks
2. Major Experiment  10 Marks
3. Minor Experiment  5 Marks
4. Viva-Voce and Record  5 Marks
DSC – 1C
Semester – III: Paper-BS 304 (Theory): BIOENERGETICS, BIOLOGICAL OXIDATIONS AND ENZYMEOLOGY
(4 Credits; 4 Hr/week)

Credit- I : Bioenergetics

1. Energy transformations in the living system
2. Free energy, Enthalpy and Entropy concepts.
3. Exergonic and endergonic reactions.
4. High energy compounds.
5. Phosphate group transfer potential.
7. Cytochromes-structure, types and their functions

Credit – II: Biological Oxidations

1. Biological oxidations: Definition, enzymes involved- oxidases, dehydrogenases and oxygenases.
2. Redox reactions. Redox couplers. Reduction potential \( (\varepsilon, \varepsilon_o, \varepsilon'_o) \). Standard reduction potential \( (\varepsilon'_o) \) of some biochemically important half reactions.
4. Oxidative phosphorylation, theories of oxidative phosphorylation- Mitchell’s chemiosmotic theory. \( F_o F_1- \) ATPase, Inhibitors of respiratory chain and oxidative phosphorylation, uncouplers.
5. Formation of reactive oxygen species and their disposal through enzymatic reactions.
6. Ultrastructure of chloroplast
7. Cyclic and non-cyclic photophosphorylation.

Credit- III : Introduction to Enzymology

1. Introduction to biocatalysis, differences between chemical and biological catalysis.
3. Definition of holo-enzyme, apo-enzyme, coenzyme, cofactor, Fundamentals of enzyme assay, enzyme units.
4. Methods of Enzyme purification
5. Enzyme specificity. Active site.
6. Principles of energy of activation, transition state.
7. Interaction between enzyme and substrate- lock and key, induced fit models.

Credit – IV: Enzyme Kinetics and Enzyme action

1. Rate of a Reaction – Law of Mass action, Factors affecting the catalysis- substrate concentration, pH, temperature, Time, Enzyme concentration and Product concentration
2. Michaelis - Menten equation for single substrate reaction, significance of \( K_M \) and \( V_{max} \).
3. Enzyme inhibition- irreversible and reversible, types of reversible inhibitions- competitive and non-competitive.
4. Outline of mechanism of enzyme action- acid-base catalysis, covalent catalysis, electrostatic catalysis, and metal ion catalysis.
5. Regulation of enzyme activity- allosterism and cooperativity, ATCase as an allosteric enzyme, covalent modulation- covalent phosphorylation of phosphorylase
6. Zymogen activation- activation of trypsinogen and chymotrypsinogen.
7. Isoenzymes (LDH) and Multienzyme complexes (PDH). Ribozyme.
References:

DSC – 1C
Semester – III: Paper - BS 304 (Practicals): ENZYMEOLOGY
(1 Credits; 2 Hr/week)

1. Assay of salivary α-amylase
2. Assay of β-amylase from sweet potatoes
3. Assay of urease
4. Assay of catalase
5. Assay of phosphatase
6. Determination of optimum temperature and pH for amylase
7. Determination of optimum pH for phosphatase
8. Effect of Substrate concentration of amylase activity

References
2. Laboratory Manual in Biochemistry- Jayaraman, J. Wiley Eastern
Model paper: Theory

Duration 3 hours           Max. Marks 80

Section - A (Short Answer Type)
Answer all Questions       8 x 4 = 32 Marks

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Section - B (Essay Answer Type)
Answer all Questions       4 x 12 = 48 Marks

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   (B)

10. (A)                      (OR)
   (B)

11. (A)                      (OR)
   (B)

12. (A)                      (OR)
   (B)
Model Paper Practicals (end of semester)

Duration 3 hours          Max. Marks   25

1. Write the Principles for the following experiments  5 Marks
2. Major Experiment       10 Marks
3. Minor Experiment       5 Marks
4. Viva-Voce and Record   5 Marks
Credit-I: Amino acid Metabolism

1. General reactions of amino acid metabolism - transamination, decarboxylation and deamination
2. Urea cycle and regulation
4. Metabolism of glycine, serine, aspartic acid, methionine, phenylalanine and leucine.
5. Biosynthesis of creatine.
6. Inborn errors of aromatic amino acids
7. Inborn errors of branched chain amino acid metabolism.

Credit-II: Carbohydrate Metabolism

1. Concept of anabolism and catabolism.
2. Glycolytic pathway, energy yield. Fate of pyruvate - formation of lactate and ethanol, Pasteur effect.
4. Glycogenolysis and glycogenesis.
5. Pentose phosphate pathway.
7. Photosynthesis - Light and Dark reactions, Calvin cycle and C₄ Pathway, CAM Pathway

Credit-III: Lipid Metabolism

1. Catabolism of fatty acids (β-oxidation) with even and odd number of carbon atoms
2. Ketogenesis
3. de novo synthesis of fatty acids
4. Elongation of fatty acids in mitochondria and microsomes
5. Biosynthesis and degradation of triacylglycerol
6. Biosynthesis of lecithin.
7. Biosynthesis of cholesterol.

Credit-IV: Nucleic acid Metabolism

1. Biosynthesis of purine and pyrimidine nucleotides, de novo and salvage pathways.
2. Regulation of purine and pyrimidine nucleotides
3. Catabolism of purines and pyrimidines.
4. Biosynthesis of deoxyribonucleotides - ribonucleotide reductase and thymidylate synthase and their significance.
5. Disorders of nucleotide metabolism - Gout, Lesch-Nyhan syndrome.
6. Biosynthesis of heme
7. Degradation of heme
References

DSC – 1 D
Paper-BS 404 (Practicals): BIOCHEMICAL PREPARATIONS AND SEPARATIONS
(1 Credits; 2 Hr/week)

2. Absorption spectra of Amino acid – Tyrosine; protein-BSA, nucleic acids- Calf thymus DNA.
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. Separation of Plant pigments by TLC

References

2. Laboratory Manual in Biochemistry- Jayaraman, J. Wiley Eastern
Model paper: Theory

Duration 3 hours           Max. Marks 80

Section - A (Short Answer Type)
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Section - B (Essay Answer Type)
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</table>
Credit-1: Physiology

1. Digestion and absorption of carbohydrates, lipids and proteins
2. Composition of blood and coagulation of blood
3. Hemoglobin and transport of gases in blood (oxygen and CO₂)
4. Heart- structure of the heart
5. Cardiac cycle, cardiac factors controlling blood pressure.
7. Structure of Neuron and propagation of nerve impulse

Credit-2: Endocrinology

2. Mechanism of hormonal action- signal transduction pathways for adrenaline, glucocorticoids and insulin.
3. Chemistry, physiological role and disorders of hormones of Pituitary, Hypothalamus and Thyroid
4. Chemistry, physiological role and disorders of hormones of Pancreas
5. Chemistry, physiological role and disorders of hormones of Parathyroid
6. Chemistry, physiological role and disorders of hormones of Gonads, Placenta and Adrenals

Credit-3: Organs and Organ Function tests

1. Structure and functions of the liver.
2. Liver function tests- conjugated and total bilurubin in serum, albumin: globulin ratio, hippuric acid and bromsulphthalein tests. Serum enzymes in liver diseases- SGPT, GGT and alkaline phosphatase.
3. Kidneys-structure of nephron and Mechanism of urine formation
4. Normal and abnormal constituents of urine.
5. Biological buffers. Role of kidneys in maintaining acid-base and electrolyte balance in the body.
6. Renal function tests- creatinine and urea clearance tests, phenol red test.
7. Biochemical tests for the diagnosis of heart diseases- HDL/LDL cholesterol, SGOT, LDH, CK, C-reactive protein, cardiac troponins.

References

3. Human Physiology – Chatterjee.C.C, Medical Allied Agency
1. Estimation of hemoglobin in blood.
2. Total count - RBC and WBC. Differential count.
3. Urine analysis for albumin, sugars and ketone bodies.
5. Estimation of blood urea.
8. Determination of SGOT and SGPT activity

References

2. Laboratory Manual in Biochemistry- Jayaraman, J. Wiley Eastern
DSE – 1 E
Semester – V: Paper-BS 506 A (Theory): Molecular Biology
(3 Credits; 3 Hr/week)

Credit- I : DNA Replication
1. Organization of genome in prokaryotes and eukaryotes.
2. Experimental evidences to prove nucleic acids as genetic material.
4. DNA replication- models of replication, Meselson-Stahl’s experimental proof for semi-conservative model.
5. DNA polymerases I, II and III of E.coli, helicase, topoisomerases, primase, ligase.
7. Inhibitors of DNA replication.

Credit- II : Transcription
1. Transcription - RNA synthesis, RNA polymerases of prokaryotes.
2. Promoters, Initiation- sigma factors and their recognition sites.
3. Elongation- role of core enzyme.
5. Transcriptional events in eukaryotic m-RNA synthesis
6. Post-transcriptional modifications of eukaryotic m-RNA. I
7. Inhibitors of RNA synthesis.

Credit- III : Translation and Regulation of Gene Expression
1. Introduction to protein synthesis- Genetic code, structure of t-RNA
2. Deciphering of genetic code, Nirenberg’s and Khorana’s experiments, wobble hypothesis, degeneracy of genetic code.
3. Protein synthesis- activation of amino acids (aminoacyl t-RNA synthetases).
5. Post- translational modifications- signal hypothesis.
6. Inhibitors of protein synthesis.

References
and Losick,R, Pearson Education.
P., Zipursky, S. L. and Darnell, J. Freeman & Co.
DSE – 1 E  
Semester – V: Paper - BS 506 A (Practicals) : Molecular Biology  
(1 Credits; 2 Hr/week)

1. Isolation of DNA from onion/liver/coconut endosperm.  
2. Isolation of plasmids  
3. Isolation of RNA  
4. Determination of purity of nucleic acids by UV-spectrophotometric method.  
5. Estimation of DNA by diphenylamine method.  
7. Electrophoresis of nucleic acids and visualization by methylene blue staining.  
8. Restriction mapping: λ- DNA with any two restriction enzymes.  

References  
2. Laboratory Manual in Biochemistry- Jayaraman, J. Wiley Eastern  
DSE – 1 E  
Semester – V: Paper-BS 506 B (Theory): Cell Biology and Genetics  
(3 Credits; 3 Hr/week) 

Credit – I: Cell Biology  
1. Cells as basic units of living organisms  
2. Composition & functions of cell organelles  
3. Cytoskeleton- Microfilaments, Microtubules & Intermediate filaments  
4. Ultra structure of prokaryotic cell and eukaryotic cells  
5. Chromosome organization in Prokaryotes and Eukaryotes and structure of chromosomes (Polytene and Lamp Brush)  
6. Mitosis and meiosis Significance of mitosis and meiosis  
7. Cell Cycle and cell death  

Credit – II: Genetics  
1. Basic concepts of Mendel’s experiments – Law of segregation and Law of Independent assortment  
2. Partial or incomplete dominance and Co-dominance  
4. Maternal inheritance (Coiling in snails, Laber’s hereditary optic neuropathy).  
5. Linkage and recombination  
6. Polygenic inheritance (Introduction to quantitative traits).  
7. Sex linked inheritance. X-linked recessive inheritance (colour blindness & Hemophilia)  

Credit – III: Mutations and Mutagens  
1. Mutations (spontaneous / induced, somatic / germinal, forward / reverse, transition / transversions)  
2. Mutations (Silent, missense, nonsense, and frame shift mutations, conditional, leaky)  
3. Detection, selection & isolation of microbial mutants  
4. Estimation of mutation rates  
5. Reversion and suppression of mutations  
6. Mutagens – physical, chemical  
7. Transposon mutagenesis, site-directed mutagenesis  

References  
1. Principles of Genetics by Eldon John Gardner, Michael J. Simmons, D. Peter Snustad; John Wiley  
4. Cell and Molecular Biology, De Robertis and De Robertis Lippincott & Wilkins  
5. Cell Biology by C. B. Pawar  
7. Theory & problems in Genetics by Stansfield, Schaum out line series McGrawhill
1. Preparation of different stages of Mitosis
2. Preparation of different stages of Meiosis
3. Types of chromosomes
4. Karyotyping
5. Problems on Monohybrid cross
6. Problems on dihybrid ratio in Drosophila/maize
7. Problems on Linkage and Recombination
8. Studies on Sex linked inheritance and X-linked recessive inheritance

References

1. Essential practical handbook of Cell Biology & Genetics, Biometry and Microbiology: A Laboratory Manual by Debarati Das, Academic Publishers
Model paper: Theory

Duration 3 hours           Max. Marks 75

Section - A (Short Answer Type)
Answer all Questions       6 x 5 = 30 Marks

1.
2.
3.
4.
5.
6.

Section - B (Essay Answer Type)

Answer all Questions   3 x 15 = 45 Marks

7. (A). (OR)
(B)

8. (A) (OR)
(B)

9. (A) (OR)
(B)
Model Paper Practicals (end of semester)

Duration 3 hours          Max. Marks  25

1. Write the Principles for the following experiments  5 Marks
2. Major Experiment         10 Marks
3. Minor Experiment          5 Marks
4. Viva-Voce and Record      5 Marks
DSC – 1 F
Semester – VI: Paper-BS 603 (Theory): Nutrition and Immunology
(3 Credits; 3 Hr/week)

Credit – I: Nutrition

2. BMR and factors affecting BMR. Specific dynamic action of foods.
3. Energy requirements and recommended dietary allowance (RDA) for children, adults, pregnant and lactating women.
5. Malnutrition- Kwashiorkar, Marasmus and PEM.
6. Vitamins - sources, structure, biochemical roles, deficiency disorders of water and fat soluble vitamins; Bulk and trace elements - Ca, Mg, Fe, I, Cu, Mo, Zn, Se and F.
7. Nutraceuticals; Obesity and starvation.

Credit – II: Immunology

1. Organization of immune system.
2. Organs and cells of immune system.
3. Innate and acquired immunity.
5. Classification of immunoglobulins, structure of IgG. Theories of antibody formation- clonal selection theory.
7. Monoclonal antibodies and their applications

Credit – III: Immunotechnology

1. Antigen-antibody reactions- agglutination, immunoprecipitation, immunodiffusion.
2. Blood group antigens.
3. Immunodiagnostics-RIA, ELISA.
5. Modern vaccines- recombinant and peptide vaccines.
6. Outlines of hypersensitivity reactions.
7. Fundamentals of graft rejection and MHC proteins.

References

1. Essentials of Food and Nutrition –Swaminathan M. Bangalore Press
1. Estimation of calcium by titrimetry
2. Estimation of iron in apple juice by phenanthroline method.
3. Estimation of vitamin C by 2, 6 -dichlorophenol indophenol method.
4. Isolation of total lipids by gravimetric method.
5. Determination of iodine value of an oil.
6. Determination of acid value of an oil.
7. Agglutination: ABO and D Ag typing
8. ODD and ELISA - sandwich ELISA

References

2. Laboratory Manual in Biochemistry- Jayaraman, J. Wiley Eastern
DSE – 1 F
Semester – VI: Paper-BS 606 A (Theory): Microbiology and r-DNA Technology
(3 Credits; 3 Hr/week)

Credit – I: Microbiology

1. Introduction to brief history of microbiology. Classification of microorganisms- prokaryotic and eukaryotic microorganisms.
2. Isolation and cultivation of bacteria. Selective media and enriched media.
4. Gram’s staining- Gram positive and Gram negative bacteria, motility and sporulation.
5. Industrial uses of Aspergillus niger, yeast and Spirulina.

Credit – II: r-DNA technology I

1. Outlines of cloning strategies.
2. DNA sequencing- Maxam Gilbert and Sanger’s methods.
3. Tools of r-DNA technology: Enzymes- Restriction endonucleases and ligases
4. Restriction mapping.
5. Cloning vectors- Plasmids, Cosmids, and λ phages
6. Hosts- E.coli
7. Molecular markers – RFLP, AFLP and RAPD

Credit – III: r-DNA technology II

2. Polymerase chain reaction- principle and applications.
3. Outlines of blotting techniques-Southern, Northern and Western.
4. Applications of gene cloning- production of insulin
5. Production of human growth hormone
6. Production of Bt cotton
7. Edible vaccines.

References

6. Molecular Biotechnology Glick, BR and Paternak, JJ. Publish ASM Press
DSE – 1 F  
Semester – VI: Paper-BS 606 A (Practicals): Microbiology and r-DNA Technology  
(3 Credits; 3 Hr/week)

1. Preparation of culture media and sterilization methods.  
2. Isolation of pure cultures: (i) Streak plate method (ii) Serial dilution method.  
3. Gram staining.  
5. Bacterial growth curve.  
6. Antibiotic sensitivity by paper disc method.  
7. Gene cloning (Demonstration only)  
8. Preparation and transformation of competent cells

References

2. Microbiology – A Laboratory manual by Cappuccino and Sherman, Pearson Publications LPE.  
3. Experiments in Microbiology, Plant Pathology and Biotechnology by Aneja A. R., New Age Publications
Credit – I: Plant Biotechnology

1. Plant tissue culture and its applications
2. Plants as bioreactors and valuable chemical factories (production of bioactive compounds)
3. Crop improvement, Production of herbicide and insect resistant plants
4. Plant metabolic engineering
5. Genetic engineering for quality improvement of Protein, lipids, carbohydrates, vitamins & mineral nutrients
6. Marker-assisted selection of qualitative and quantitative traits.
7. Genetically modified crops – Golden rice, soybeans, Bt cotton, tobacco, potato, papaya, jatropha, Arabidopsis

Credit – II: Animal and Microbial Biotechnology

1. Animal cell cultures as bioreactors
2. Usage of animal cell culture for in vitro drug testing
3. Molecular pharming: Production of vaccines, pharmaceutical proteins, recombinant hemoglobin and blood substituents
4. Microbes as biocontrol agents
5. Overview of Microbial insecticides (Baculoviruses, Bacillus thurinigiensis and Bacillus sphaericus)
6. Bioremediation, Biodegradation of cellulose and lignocellulose, biosurfactants and bioemulsifiers
7. Microbial ore leaching and production of microbial fuels (hydrogen, methane)

Credit – III: Environmental Biotechnology

1. Renewable and Non-renewable energy sources
2. Strategies involved in Municipal solid waste treatment
3. Treatment of industrial and domestic effluent (aerobic and anaerobic)
4. Biomaterials as an alternative to non-degradable materials
5. Microorganisms for Heavy Metal Accumulation
6. Biosorption
7. Heavy metal tolerance (including mechanism) and its impact on environment

References:

1. Introduction to Biotechnology, William J. Thieman, Michael A. Palladino, Benjamin Cummings Publ
2. Biotechnology- Arora, Himalaya pub. House
3. Introduction to Environmental Biotechnology by A. K. Chatterji, PHI Learning Pvt. Ltd.
4. Animal Cells as Bioreactors - By Terence Gartoright, Cambridge Univ Press
5. Text Book of Biotechnology - By H.K. Das (Wiley Publications)
7. Industrial Microbiology by L.E. Casida
1. Preparation of MS medium and initiation of callus
2. Micropropagation of plants
3. Preparation of animal cell culture media, Cell disaggregation and cell counting
4. Isolation of microbes from environment (soil, water, skin bread, milk)
5. Microbial degradation of organic matter
6. Efficacy testing for biofertilizers (nodulation test for rhizobia) and biopesticides
7. Municipal solid waste treatment and Waste water treatment
8. Production of hydrogen and methane

References

1. Microbial Biotechnology – A Laboratory Manual for bacterial systems by Das, Surajit, Dash, Hirak Ranjan, Springer-Verlag
2. Plant Tissue Culture by Kalyan Kumar De
3. Biogas Technology by b.T. Nijaguna
4. Biotechnology procedures and experiments handbook by S. Harisha, Infinity Science Press LLC.
Model paper: Theory
Duration 3 hours           Max. Marks 75

Section - A (Short Answer Type)
Answer all Questions       6 x 5 = 30 Marks
1.
2.
3.
4.
5.
6.

Section - B (Essay Answer Type)
Answer all Questions       3 x 15 = 45 Marks
7. (A)                        (OR)
    (B)
8. (A)                        (OR)
    (B)
9. (A)                        (OR)
    (B)
Model Paper Practicals (end of semester)

Duration 3 hours          Max. Marks  25

1. Write the Principles for the following experiments   5 Marks
2. Major Experiment       10 Marks
3. Minor Experiment       5 Marks
4. Viva-Voce and Record   5 Marks