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Unit – I: Biophysical Concepts
1.1 Water as a biological solvent and its role in biological processes.
1.2 Biological relevance of pH, Measurement of pH.
1.3. pKa of functional groups in biopolymers such as proteins and nucleic acids.
1.4 Importance of buffers in biological systems.
1.5 Donnan membrane equilibrium, significance of osmotic pressure in biological systems.

Unit – II: Carbohydrates
2.1 Carbohydrates: Classification, monosaccharides, D and L designation, open chain and cyclic structures, epimers and anomers, mutarotation
2.2 Reactions of carbohydrates (due to functional groups - hydroxyl, aldehyde and ketone).
2.3 Amino sugars, Glycosides.
2.4 Structure and biological importance of disaccharides
(sucrose, lactose, maltose, isomaltose, trehalose), trisaccharides (raffinose, melezitose),
2.5 Structural Polysaccharides (cellulose, chitin, pectin) and storage polysaccharides (starch, inulin, glycogen).
2.6 Glycosaminoglycans, Bacterial cell wall polysaccharides.
2.7 Outlines of glycoproteins, glycolipids and blood group substances.

Unit – III Lipids
3.1 Lipids: Classification, saturated and unsaturated fatty acids.
3.2 Structure and properties of fats and oils
( Acid, saponification and iodine values, rancidity).
3.3 General properties and structures of phospholipids, sphingolipids and cholesterol
3.4 Prostaglandins- structure and biological role of PGD2, PGE2 and PGF2
3.5 Lipoproteins: Types and functions.
3.6 Biomembranes: Behaviour of amphipathic lipids in water- formation of micelles, bilayers, vesicles and liposomes.
3.7 Membrane composition and organization – Fluid mosaic model.

**Unit-IV: Amino Acids and Peptides**
4.1 Amino Acids: Classification, structure, stereochemistry.
4.2 Chemical reactions of amino acids due to carbonyl and amino groups.
4.3 Titration curve of glycine and pK values.
4.4 Essential and non-essential amino acids, non-protein amino acids.
4.5 Peptide bond - nature and conformation.
4.6 Naturally occurring peptides – glutathione, enkephalin.

**Unit-V: Proteins**
5.1 Proteins: Classification based on solubility, shape and function
5.2 Determination of amino acid composition of proteins.
5.3 General properties of proteins, denaturation and renaturation of proteins.
5.4 Structural organization of proteins- primary, secondary, tertiary and quaternary structures
(E.g. Haemoglobin and Myoglobin)
5.5 Forces stabilizing the structure of protein.
5.6 Outlines of protein sequencing
I. Answer any FIVE of the following: 
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II. Answer any FIVE of the following: 
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BIOCHEMISTRY PRACTICAL SYLLABUS FOR I SEMESTER

BIOCHEMISTRY - PAPER – I

BIOMOLECULES

Periods: 24 Max. Marks: 50

List of Experiments:
1. Preparation of buffers (acidic, neutral and alkaline) and determination of pH.
2. Titration curve of glycine and determination of pK and pI values.
3. Qualitative identification of carbohydrates- glucose, fructose, ribose/xylose, maltose, sucrose, lactose, starch/glycogen.
4. Qualitative identification of amino acids – histidine, tyrosine, tryptophan, cysteine, arginine.
7. Absorption maxima of colour substancesp-Nitrophenol, Methyl orange.
8. Absorption spectra of protein-BSA, nucleic acids- Calf thymusDNA
NUCLEIC ACIDS AND BIOCHEMICAL TECHNIQUES

**Unit-I: Nucleic Acids**

1.1 Nature of nucleic acids.
1.2 Structure of purines and pyrimidines, nucleosides, nucleotides.
1.3 Stability and formation of phosphodiester linkages. Effect of acids, alkali and nucleases on DNA and RNA.
1.4 Structure of Nucleic acids- Watson-Crick DNA double helix structure,
1.5 Introduction to circular DNA, supercoiling.
1.6 Denaturation of nucleic acids- hyperchromic effect, $T_m$-values and their significance.
1.7 Reassociation kinetics, cot curves and their significance.
1.8 Types of RNA and DNA.

**Unit-II: Porphyrins**

2.1 Structure of porphyrins, protoporphyrin, porphobilinogen
2.2 Properties, Identification of Porphyrins.
2.3 Structure of Metalloporphyrins–heme, cytochromes and chlorophylls.

**Unit-III: Biochemical Techniques I**

3.1 Methods of tissue homogenization: (Potter-Elvejham, mechanical blender, sonicator and enzymatic).
3.2 Principle and applications of centrifugation techniques- differential, density gradient. Ultracentrifugation-- preparative and analytical.
3.3 Principle and applications of chromatographic techniques- paper, thin layer, gel filtration, ion- exchange and affinity chromatography.
3.4 Electrophoresis- principles and applications of paper, polyacrylamide (native and SDS) and agarose gel electrophoresis.
Unit-IV: Biochemical Techniques II

4.2 UV and visible absorption spectra, molar extinction coefficient, biochemical applications of spectrophotometer.
4.3 Principle of fluorimetry.
4.4 Tracer techniques: Radio isotopes, units of radio activity, half life, β and γ- emitters, use of radioactive isotopes in biology.

Unit- V: Techniques employed in metabolic studies

5.1 Broad outlines of Intermediary metabolism
5.2 Methods of investigation, Intermediary metabolism-- in vivo studies such as analysis of excretion, respiratory exchange, removal of organs and perfusion studies
5.3 In vitro studies such as tissue slice techniques; Homogenates and purified enzyme systems;
5.4 Isotope tracer studies,
5.5 Use of inhibitors and antimetabolite
I. Answer any FIVE of the following: 5x5=25
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II. Answer any FIVE of the following: 5x10=50
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BIOCHEMISTRY PRACTICAL SYLLABUS FOR II SEMESTER

BIOCHEMISTRY - PAPER – II

NUCLEIC ACIDS AND BIOCHEMICAL TECHNIQUES

Periods: 24 Max. Marks: 50

List of Experiments:
1. Isolation of RNA and DNA from tissue/culture.
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.
9. Separation of plant pigments by TLC
**BIOCHEMISTRY SYLLABUS FOR III SEMESTER**

**BIOCHEMISTRY - PAPER – III**

**ENZYMOMOLOGY AND BIOENERGETICS**

Periods: 60  
Max. Marks:100

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**Unit-I: Classification of Enzymes and Structure**

1.1 Introduction to biocatalysis, differences between chemical and biological catalysis.
1.2 Nomenclature and classification of enzymes.
1.3 Enzyme specificity
1.4 Active site, principles of energy of activation, transition state.
1.5 Interaction between enzyme and substrate - lock and key, induced fit models
1.6 Definition of holoenzyme, apo-enzyme, coenzyme, co-factor.
1.7 Fundamentals of enzyme assay, enzyme units.

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

2.1 Factors affecting the catalysis- substrate concentration, pH, temperature.
2.2 Michaelis-Menten equation for uni-substrate reaction (derivation not necessary),
2.3 Significance of KM and Vmax
2.4 Enzyme inhibition – irreversible and reversible type’s inhibitions- competitive and non-competitive.

**Unit-III: Mechanism of enzyme action**

3.1 Outline of mechanism of enzyme action- acid-base catalysis, covalent catalysis, electrostatic catalysis, and metal ion catalysis
3.2. Regulation of enzyme activity-allosterism and co-operativity,
3.3 ATCase as an allosteric enzyme,
3.4 Covalent modulation- covalent phosphorylation of phosphorylase
3.5 Zymogen activation- activation of trypsinogen and chymotrypsinogen.
3.6 Isoenzymes (LDH). Multienzymecomplexes (PDH). Ribozyme

**Unit- IV: Bioenergetics**
4.1 Bioenergetics: Thermodynamic principles, chemical equilibria, free energy, enthalpy (H), entropy (S)
4.2 Free energy change in biological transformations in living systems;
4.3 High energy compounds.
4.4 Oxidation-reduction reactions.

Unit V: Biological Oxidations in Mitochondria

5.1 Organization of electron carriers and enzymes in mitochondria.
5.2 Classes of electron-transferring enzymes, inhibitors of electron transport.
5.3 Oxidative phosphorylation, mechanism of oxidative phosphorylation.
5.4 Uncouplers and inhibitors of oxidative phosphorylation
I. Answer any FIVE of the following:  5x5=25
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BIOCHEMISTRY PRACTICAL SYLLABUS FOR III SEMESTER

BIOCHEMISTRY - PAPER – III

ENZYMEOLOGY AND BIOENERGETICS

Periods: 24  Max. Marks: 50

List of Experiments:
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 pH for phosphatise
INTERMEDIARY METABOLISM

Unit- I: Carbohydrate Metabolism
1.1 Concept of anabolism and catabolism.
1.2 Glycolytic pathway, energy yield. Fate of pyruvate- formation of lactate and ethanol, Pasteur effect.
1.3 Citric acid cycle, regulation, energy yield, amphipathic role. Anaplerotic reactions.
1.4 Glycogenolysis and glycogenesis.
1.5 Pentose phosphate pathway, gluconeogenesis.
1.6 Photosynthesis- Light and Dark reactions, Calvin cycle, C4 Pathway.
1.7 Disorders of carbohydrate metabolism.

Unit- II: Lipid Metabolism
2.1 Catabolism of fatty acids (β- oxidation) with even and odd number of carbon atoms.
2.2 Ketogenesis.
2.3 De novo synthesis of fatty acids.
2.4 Elongation of fatty acids in mitochondria and microsomes.
2.5 Biosynthesis and degradation of triacylglycerol and lecithin.
2.6 Biosynthesis of cholesterol.
2.7 Disorders of lipid metabolism.

Unit- III: Metabolism of Amino acids
3.1 General reactions of amino acid metabolism- transamination, decarboxylation and deamination
3.2 Urea cycle and regulation.
3.3 Catabolism of carbon skeleton of amino acids- glycogenic and ketogenic amino Acids.
3.4 Metabolism of glycine, serine, aspartic acid, methionine, phenylalanine and leucine.
3.5 Biosynthesis of creatine.
3.6 Inborn errors of aromatic and branched chain amino acid metabolism.

Unit- IV: Nitrogen Fixation
4.1 Nitrogen cycle,
4.2 Non-biological and biological nitrogen fixation.
4.2 Nitrogenase system.
4.3 Utilization of nitrate ion, Ammonia incorporation into organic compounds.
4.4 Synthesis of glutamine and regulatory mechanism of glutamine synthase.

Unit V: Metabolism of Nucleic acid and heme:

5.1 Biosynthesis and regulation of purine and pyrimidine nucleotides. (De novo and salvage pathways)
5.3 Catabolism of purines and pyrimidines.
5.4 Biosynthesis of deoxyribonucleotides- ribonucleotide reductase and thymidylate synthase and their significance.
5.5 Disorders of nucleotide metabolism- Gout, Lesch Nyhan Syndrome.
5.6 Biosynthesis and degradation of heme.
I. Answer any FIVE of the following:  5x5=25
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II. Answer any FIVE of the following:  5x10=50
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BIOCHEMISTRY PRACTICAL SYLLABUS FOR IV SEMESTER

BIOCHEMISTRY - PAPER – IV

QUANTITATIVE ANALYSIS

Periods: 24 Max. Marks: 50

List of Experiments:
1. Estimation of amino acid by Ninhydrin method.
2. Estimation of protein by Biuret method.
4. Estimation of glucose by DNS method.
5. Estimation of glucose by Benedict’s titrimetric method
UNIT- I: Blood and Cardiovascular physiology

1.1 Intracellular, extracellular and interstitial fluid.
1.2 Composition of blood
1.3 Transport of gases in blood (O₂ and CO₂).
1.4 Molecular mechanism of blood coagulation, anticoagulant and fibrinolytic systems.
1.5 Heart- structure of the heart, cardiac cycle,
1.6 Cardiac factors controlling blood pressure

UNIT-II: Gastrointestinal and Renal physiology

2.1 Digestion and absorption of carbohydrates, lipids and proteins.
2.2 Metabolic importance of liver.
2.3 Structure of Kidneys-Nephron.
2.4 Urine formation, normal and abnormal constituents of urine.
2.5 Role of kidneys in maintaining acid-base and electrolyte balance in the body.

UNIT-III: Muscle and Neuronal physiology

3.1 Kinds of muscles and mechanism of muscle contraction.
3.2 Central Nervous system, Peripheral Nervous system.
3.3 Blood brain barrier and CSF
3.4 Membrane potentials, Synaptic transmission, Neurotransmitters

UNIT—IV Clinical biochemistry

4.1 Collection of blood and storage.
4.2 Separation and storage of serum.
4.3 Plasma proteins in health and disease.

4.4 Disorders of blood coagulation – haemophilia, and thrombosis

4.3 Types of anaemias, polycythaemia, haemoglobinopathies-sickle cell anaemia.

4.4 Hypertension, congestive heart disease, atherosclerosis and myocardial infarction.

4.5 Involvement of enzymes in diagnostics of heart disease including aspartate transaminase, isoenzymes of creatinekinas and lactate dehydrogenase and troponin.

**UNIT—4 CLINICAL BIOCHEMISTRY – II**

5.1 Liver function tests- conjugated and total bilurubin in serum, albumin: globulin ratio,

5.2 Serum enzymes in liver diseases- SGPT, GGT and alkaline phosphatase.

5.3 Renal function tests- creatinine and urea clearance tests, phenol red test.

5.4 Acidosis and alkalosis. Glomerular nephritis, renal failure, dialysis and diuretics

5.5 Clinical significance of variations in blood glucoseDiabetes mellitus.

5.6 Clinical significance of elevated lipoproteins
I. Answer any FIVE of the following: 5x5=25
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BIOCHEMISTRY PRACTICAL SYLLABUS FOR V SEMESTER

BIOCHEMISTRY - PAPER – V

HUMAN PHYSIOLOGY (PRACTICALS)

1. Haematology.
   a. RBC and WBC counting
   b. Differential leucocyte count.
   c. Clotting time.
2. Separation of plasma proteins.
3. Urine analysis for albumin, sugars and ketone bodies.
5. Estimation of blood Glucose.
6. Estimation of serum total cholesterol
7. Histology of connective tissue, liver and/ brain permanent slides.
8. Case studies (Renal clearance, GFR, ECG).
UNIT – I Overview and Cells and Organs of Immune system

1.1 Introduction to basic concepts in Immunology
1.2 Innate and adaptive immunity
1.3 Cells of immune system
1.4 Organs of immune system
1.5 Major histocompatibility complexes

UNIT – II Antigens and Antibodies & Immune system in Health and Disease

2.1 Basic properties of antigens, factors influencing immunogenicity
2.2 B and T cell epitopes, haptens and adjuvants
2.3 Structure of antibody, classes and functions of antibodies
2.4 Monoclonal antibodies
2.5 Classification and brief description of various types of hyper sensitivities
2.6 Introduction to concepts of autoimmunity and immunodeficiency
2.7 General introduction to Vaccines, Types of vaccines

Unit – III Endocrinology

3.1 Organization of endocrine system.
3.2 Classification of hormones.
3.3 Mechanism of hormonal action, signal transduction pathways
3.4 The physiological and biochemical actions of hypothalamic hormones,
3.5 Pituitary hormones - GH, prolactin, TSH, LH, FSH, POMC peptide
Family, oxytocin and vasopressin

3.6 Gigantism, acromegaly, dwarfs, pigmies and diabetes insipidus.

Unit –IV Endocrinology II

Outlines of chemistry, physiological role and disorders of:

4.1 Hormones of pancreas
4.2 Thyroid, parathyroid hormones
4.3 Hormones of Gonads, placenta
4.4 Hormones of Adrenal glands

4.5 Introduction of gastrointestinal hormones.

Unit –V Nutritional Biochemistry

5.1 Balanced diet. Calorific values of foods and their determination by bomb calorimeter.
5.2 BMR and factors affecting it. Specific dynamic action of foods.
5.3 Energy requirements and recommended dietary allowance (RDA) for children, adults, pregnant and lactating women.
5.4 Sources of complete and incomplete proteins. Biological value of proteins.
5.5 Malnutrition- Kwashiorkor, Marasmus and PEM.
5.6 Vitamins- sources, structure, biochemical roles, deficiency disorders of water and fat soluble vitamins.
5.7 Bulk and trace elements-Ca, Mg, Fe, I, Cu, Mo, Zn, Se and F. Obesity and starvation.
BIOCHEMISTRY MODEL PAPER – IV SEMESTER

BIOCHEMISTRY- PAPER – - IV

INTERMEDIARY METABOLISM

Max. Marks: 75

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II. Answer any FIVE of the following: 5x10=50
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BIOCHEMISTRY PRACTICAL SYLLABUS FOR V SEMESTER

BIOCHEMISTRY - PAPER – VI

IMMUNOLOGY & NUTRITION

Periods: 24 Max. Marks: 50

1. Estimation of calcium by titrimetry
2. Estimation of iron by Wong’s method.
3. Estimation of vitamin C by 2, 6-dichlorophenol indophenol method.
4. Determination of iodine value of oil.
5. Determination of blood group and Rh typing.
6. Visualization of antigen antibody reactions (Ouchterlony technique).
7. HCG based pregnancy test.
8. Glucose tolerance test
MICROBIOLOGY AND MOLECULAR BIOLOGY

Unit- I: Microbiology

1.1 Introduction to brief history of microbiology. Classification of microorganisms--prokaryotic and eukaryotic microorganisms.

1.2 Isolation and cultivation of bacteria. Selective media and enriched media.

1.3 Bacterial growth curve and kinetics of growth. Gram’s staining- Gram positive and Gram negative bacteria, motility and sporulation.

1.4 Structure and composition of viruses. Isolation and cultivation of bacterial plaques.

1.5 Lytic and lysogenic life cycle of λ phage.

1.6 Retro viruses- HIV.

UNIT- II: DNA Replication and Transcription

2.1 Nature and structure of the gene.

2.2 DNA replication- models of replication, Meselson-Stahl’s experimental proof for semi-conservative model.

2.3 DNA polymerases I, II and III of E.coli, helicase, topoisomerases, primase, ligase.

2.4 Bidirectional replication model. Okazaki fragments, leading and lagging strands of DNA synthesis.

2.5 Inhibitors of DNA replication.


Unit- III Protein Synthesis and Regulation of Gene Expression

3.1 Introduction to protein synthesis- Genetic code, deciphering of genetic code
3.2 Nirenberg’s and Khorana’s experiments

3.3 Wobble hypothesis, degeneracy of genetic code.

3.4 Protein synthesis- activation of amino acids (aminoacyl t-RNA synthases).

3.5 Ribosome structure. Initiation, elongation and termination of protein synthesis.

3.6 Post- translational modifications- 

3.7 Signal hypothesis.

3.8 Inhibitors of protein synthesis.

3.9 Regulation of prokaryotic gene expression- induction and repression. Lac operon.

**Unit-IV: Recombinant DNA Technology**

4.1 Outlines of cloning strategies.

4.2 DNA sequencing- Maxam Gilbert and Sanger’s methods.

4.3 Tools of r-DNA technology: Enzymes- Restriction endonucleases, ligase, phosphatases, reverse transcriptase, polynucleotide kinases, terminal transferases nucleases-S₁ and RNAase H. Restriction mapping.

4.4 Cloning vectors- Plasmid, Expression vector - Host- E.coli.

4.5 Construction of C-DNA and Genomic libraries. Isolation and sequencing of cloned genes- Colony hybridization, Nucleic acid hybridization.

4.6 Polymerase chain reaction- principle and applications.

4.7 Outlines of blotting techniques-Southern, Northern and Western.

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

**Unit V --Applied Biochemistry**

5.1 Fermentation Technology: Batch, continuous culture techniques,

5.2 Principle types of fermentors. Industrial production of chemicals- alcohol, acids (citric acid), solvents (acetone), antibiotics (penicillin),

28
5.3 Enzyme Technology: Immobilization of enzymes and cells, different methods. Industrial applications.

5.4 Production of Transgenic plants and their applications.

5.5 Introduction to Bioinformatics- definitions of proteomics and genomics. Gene bank, NCBI, DDBJ, Swissprot, PDB. Sequence alignments- BLAST and FASTA.
BIOCHEMISTRY MODEL PAPER FOR VI SEMESTER

BIOCHEMISTRY - PAPER – VII-A

MICROBIOLOGY AND MOLECULAR BIOLOGY

Time: 3 hrs  Max. Marks: 75

I. Answer any FIVE of the following:  5x5=25
   Draw labelled diagrams wherever necessary
   1. 
   2. 
   3. 
   4. 
   5. 
   6. 
   7. 
   8. 

II. Answer any FIVE of the following:  5x10=50
   Draw labelled diagrams wherever necessary
   9. 
   10. 
   11. 
   12. 
   13. 
   14. 
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   16. 
   17. 
   18. 

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OR
BIOCHEMISTRY PRACTICAL SYLLABUS FOR VI SEMESTER

BIOCHEMISTRY - PAPER – VII-A

MICROBIOLOGY AND MOLECULAR BIOLOGY

Periods: 24 Max. Marks: 50

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.
5. Antibiotic sensitivity by paper disc method.
6. Isolation of DNA from onion/liver/coconut endosperm.
7. Estimation of DNA by diphenylamine method.
9. Sequence alignments of insulin/BSA with other proteins using BLAST and FASTA.
10. Examination of milk quality by MBRT method.
AP STATE COUNCIL OF HIGHER EDUCATION  
w.e.f. 2015-16 (Revised in April, 2016)

BIOCHEMISTRY SYLLABUS FOR VI SEMESTER

BIOCHEMISTRY - PAPER – VII (B)

CELL BIOLOGY & GENETICS

Periods: 60  Max. Marks: 100

Unit I - Ultra structure of eukaryotic cell.

Cell organelles- Nucleus, Golgi complex, Mitochondria, Chloroplast, endoplasmic reticulum, lysosomes, peroxisome, glyoxisomes and vacuoles.

Unit II - Genes and their variations:

Unit III Mendels Laws and Inheritance
Mendel experiments, Mendel Laws and deviations: incomplete dominance and Codominance Penetration and pleiotropism, Recessive and Dominant epistatic gene interactions. Concept of multiple alleles.

Unit IV: Gene mutation
Spontaneous and induced- Point and Frame shift.
DNA Damage and DNA Repair- Excision repair and mismatch repair.

Unit V
Cell cycle and Cell division, Apoptosis
Suggested Books:
BIOCHEMISTRY MODEL PAPER FOR VI SEMESTER
BIOCHEMISTRY - PAPER – VII(B)
CELL BIOLOGY& GENETICS

Time: 3 hrs
Max. Marks: 75

SECTION – A

Answer and FIVE of the following 5x5=25 Marks

Draw neat labeled diagrams wherever necessary.

1. 
2. 
3. 
4. 
5. 
6. 
7. 
8. 

SECTION – B

Answer any FIVE of the following 5X10=50 Marks

Draw neat labeled diagrams wherever necessary.

11. a) 
   OR
   b) 

12. a) 
   OR
   b) 

13. a) 
   OR
   b)
14. a) 

b) OR

15. a) OR
BIOCHEMISTRY PRACTICAL SYLLABUS FOR VI SEMESTER

BIOCHEMISTRY - PAPER – VII (B)

CELL BIOLOGY AND GENETICS

Periods: 45  Max. Marks: 50

1. Study of different phases of mitosis in onion root tips and meiosis in Allium cepa flower buds.
2. Karyotyping in Allium or Drosophila.
3. Determination of multiple allele frequencies of leaf scars in Trifolium.
4. Problems and assignments in Mendelian genetics.
6. Induction of chromosomal aberrations by chemical mutagenesis in Allium (or any plant).
7. Isolation of auxotrophic mutants (plants or insects).
8. Repair of DNA by Photo activation of Photolyase in bacteria.
9. Mutation of bacteria by UV.
10. Chemical induced mutation in bacteria
11. Stages in Mitosis
12. Stages in Meiosis.

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BIOCHEMISTRY SYLLABUS FOR VI SEMESTER

BIOCHEMISTRY - PAPER – VII (C)

BASIC MICROBIOLOGY

Hours 60  Marks 100

Unit –I: History of development of microbiology

1.1 Development of microbiology as a discipline, Spontaneous generation vs. biogenesis.

1.2 Contributions of Anton von Leeuwenhoek, Louis Pasteur, Robert Koch, Joseph Lister, Alexander Fleming.

1.3 Role of microorganisms in fermentation,

1.4 Germ theory of disease

1.5 Development of various microbiological techniques.

1.6 Establishment of fields of medical microbiology and immunology through the work of Paul Ehrlich, Elie Metchnikoff, Edward Jenner

Unit-II: Diversity of microbial world

2.1 Binomial Nomenclature

2.2 Whittaker’s five kingdom and Carl Woese’s three kingdom classification systems and their utility.

2.3 Difference between prokaryotic and eukaryotic microorganisms.

2.4 General characteristics of different groups: acellular microorganisms (Viruses, Viroids, Prions) and Cellular microorganisms (Bacteria, Algae, Fungi and Protozoa) with emphasis on distribution and occurrence and mode of reproduction.

Unit-III: Viruses, Bacteria and Protozoa
3.1 An introduction to viruses with special reference to the structure and replication of the following: Poxvirus and Poliovirus

3.2 Bacterial Diseases- Cholera and Typhoid.

3.3 Viral diseases TMV and T4.

3.4 Protozoan Diseases- Amebiasis and Malaria.

**Unit- IV: Algae**

4.1 History of phycology.

4.2 General characteristics of algae: occurrence, thallus organization,

4.3 Algae cell ultra-structure, pigments, flagella, eyespot food reserves

4.4 Vegetative, asexual and sexual reproduction.

4.5 Applications of Algae in agriculture, industry, environment and food.

**Unit- V: Fungi**

5.1 General characteristics of fungi - habitat, distribution, nutritional requirements,

5.2 Fungal cell ultrastructure, thallus organization and aggregation, fungal wall structure and synthesis,

5.3 Asexual reproduction, sexual reproduction, heterokaryosis, heterothallism and parasexual mechanism.

5.4 Economic Importance of Fungi in Agriculture, environment, Industry, medicine, food, biodeterioration,

5.5 Mycotoxins
I. Answer any FIVE of the following: 5x5=25
   Draw labeled diagrams wherever necessary
1. 
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II. Answer any FIVE of the following: 5x10=50
   Draw labeled diagrams wherever necessary
9. 
   OR
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   OR
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   OR
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OR
16.
List of Experiments:

1. Microbiology Laboratory Practices and Biosafety.

2. To study the principle and applications of important instruments (biological safety cabinets, autoclave, incubator, BOD incubator, hot air oven, light microscope, pH meter)

3. Preparation and sterilization of culture media for bacterial cultivation

4. Study of different shapes of bacteria, fungi, algae, protozoa using permanent slides/pictographs

5. Staining of bacteria using Gram stain

6. Isolation of pure cultures of bacteria by streaking method.


SUGGESTED READINGS


UNIT – I: LABORATORY PREPARATION IN HAEAMATOLOGY:

UNIT – II: ROUTINE HAEAMATOLOGY:

UNIT – III: HAEAMOSTASIS AND HAEAMATOLOGICAL DISEASES:

UNIT- IV: AUTOMATION IN HAEAMATOLOGY:
Unit - V: Immunohaematology and Blood banking:

SUGGESTED READINGS
- Park, K. (2007), Preventive and Social Medicine, B.B. Publishers
- Cheesbrough M., A Laboratory Manual for Rural Tropical Hospitals, A Basis for Training Courses
- Prakash, G. (2012), Lab Manual on Blood Analysis and Medical Diagnostics, S. Chand and Co. Ltd.
BIOCHEMISTRY MODEL PAPER FOR VI SEMESTER
BIOCHEMISTRY - PAPER - VIII
Cluster Elective Paper: VIII-A-1
HAEMATOLOGY

Time: 3 hrs
Max. Marks: 75

I. Answer any FIVE of the following: 5x5=25
Draw labeled diagrams wherever necessary
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II. Answer any FIVE of the following: 5x10=50
Draw labeled diagrams wherever necessary
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BIOCHEMISTRY SYLLABUS FOR VI SEMESTER


CLINICAL MICROBIOLOGY

Hours 60 Marks 100

Unit – I: Introduction to Clinical Microbiology:

Unit – II: Clinical Bacteriology Laboratory & Staining methods:

Unit – III: Culturing of Microorganisms and Identification of Bacteria:

Unit - IV: Clinical Mycology and Virology:
Basic morphological classification of clinically important fungi. Parasitic fungi – Superficial Mycoses and Dermatophytes, Subcutaneous Mycoses, Intermediate Superficial Deep Mycoses and Deep or Systemic mycoses. Classification based on symptomatology. Some important
viruses and related diseases (Measles viruses, Influenza viruses, Rotaviruses, Polioviruses, Herpes viruses, Rabies viruses, Hepatitis viruses. General transmission routes for viruses.

Unit - V: Diagnostic Serology:

SUGGESTED READINGS
• Park, K. (2007), Preventive and Social Medicine, B.B. Publishers
• Cheesbrough M., A Laboratory Manual for Rural Tropical Hospitals, A Basis for Training Courses
• Guyton A.C. and Hall J.E. Textbook of Medical Physiology.
• Robbins and Cortan, Pathologic Basis of Disease, VIII Edition.
• Prakash, G. (2012), Lab Manual on Blood Analysis and Medical Diagnostics, S. Chand and Co. Ltd.

BIOCHEMISTRY MODEL PAPER FOR VI SEMESTER
I. Answer any FIVE of the following:  
Draw labeled diagrams wherever necessary  
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II. Answer any FIVE of the following:  
Draw labeled diagrams wherever necessary  
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OR  

12.  

OR
BIOCHEMISTRY SYLLABUS FOR VI SEMESTER


BIOCHEMICAL CORRELATIONS IN DISEASES

Hours 60

Marks 100

Unit- I: Inborn errors of metabolism
Alkaptonuria, Phenylketonuria, Glycogen and Lipid storage diseases, SCID,
Diseases caused due to misfolded proteins: Alzheimer’s, Huntington’s disease, Kuru,
Creutzfeldt-Jakob disease,

Unit- II: Nutritional Deficiency and Life style diseases
Kwashiorkar, Marasmus.Beri-beri, Scurvy, Pellagra. Nightblindedness. Rickets,
Osteomalacia, Osteoporosis. Wilson’s disease. Obesity. Cardiovascular diseases, Atherosclerosis,
Diabetes mellitus-II. Inflammatory Bowel Disease (IBD).

Unit- III: Hormonal Imbalances and Autoimmune diseases
Outline of hormone action and imbalances leading to disease - premature puberty, hyper and
hypopituitarism. Hyper and hypothyroidism. Concepts in immune recognition - self and non self-
discrimination, organ specific autoimmune diseases – Hashimoto’s thyroiditis, Grave’s
disease, myastheniagravis; Systemic diseases - SLE, rheumatoid arthritis; Diabetes Mellitus-I.

Unit- IV: Classification of infectious agents
Bacteria, Viruses, protozoa and fungi. Past and present emerging and re-emerging infectious
diseases and pathogens. 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.

Unit- V: Infectious diseases
Viral infection (polio, measles, mumps, influenza, HIV).
Bacterial infections (tetanus, diphtheria, tuberculosis, typhoid, cholera).
Protozoan (Plasmodium and Trypanosoma) and parasitic infections.
Vaccines against diseases. General strategies in the design and development of vaccines.

CLUSTER ELECTIVE – VIII-A: VI SEMESTER
MEDICAL DIAGNOSTICS

PRACTICAL – 1 CLINICAL BIOCHEMISTRY

- Collection of blood specimen and serum preparation.
- Blood glucose and urine glucose estimation.
- LFT, Kidney Function and Cardiac Profile tests.
- Determination of serum proteins, SGOT, SGPT, S.ALP, S.ACP
- Determination of sodium, potassium and chlorides

PRACTICAL – 2 HAEMATOLOGY & CLINICAL MICROBIOLOGY

- Routine haematological tests – Blood smear preparation, TC, DC, ESR, Platelet count.
- Determination of Haemoglobin.
- Determination of PCV.
- Determination of bleeding time.
- Determination of blood clotting time.
- Blood Grouping.
- Preparation of nutrient agar, culture plates and isolation of bacteria on nutrient agar plate.
- Study of permanent slides of Candida albicans, Enterobactersps, Pseudomonas, Salmonella sps, Shigellasps, Staphlococcusaureus, Streptococcus pyogenes and Vibrio cholera.
- Staining methods – Albert’s and Gram’s staining methods.
- Hepatitis test and Pregnancy test using ELISA
- VDRL qualitative and quantitative test.
- WIDAL slide agglutination and tube agglutination test.

PRACTICAL - III: PROJECT WORK

Associated with a Clinical Diagnostic Laboratory.

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BIOCHEMISTRY SYLLABUS FOR VI SEMESTER

Biochemistry Cluster Elective Paper: VIII-B-1

rDNA TECHNOLOGY

Unit I Restriction and Modification
Enzymes used in molecular cloning; Polymerases, ligases, phosphatases, kinases and nucleases. Classification of restriction endonucleases.

Unit II Cloning Vectors
Cutting and joining DNA (cohesive end ligation, methods of blunt end ligation). Screening methods (Genetic marker and blue white screening)

Unit III Methods of gene sequencing
Maxam - Gilberts and Sanger’s dideoxy chain termination methods; Polymerase chain reaction technique (Components in PCR and PCR conditions), Blotting techniques.

Unit IV Methods of gene transfer
Methods of gene transfer in fungi, yeast and higher plants using microinjection, micro projectile bombardment (gene gun method, Electroporation, transformation and Selection of transformed cells.

Unit V Applications of r DNA technology
Applications of recombinant DNA technology in Agriculture (Transgenic Plants) Medicine (production of Insulin, Growth harmone, Tissue plasmogen activator and HBsAg vaccine)
Suggested Books:


I. Answer any FIVE of the following: 5x5=25

Draw labeled diagrams wherever necessary
1.
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II. Answer any FIVE of the following: 5x10=50

Draw labeled diagrams wherever necessary
9. OR

10. OR

11. OR

12. OR

13.
Unit I: Cell and tissue culture:
Introduction to cell and Tissue culture Laboratory facilities, Tissue culture media (composition and preparation) Callus and suspension cultures: initiation and maintenance of callus and suspension cultures; single cell clones.

Unit II: Tissue and micro-propagation:
Regeneration, production of haploids, protoplast culture and somatic hybridization. Cloning in plants - Ti plasmid organization. Concept of transgenic plants Bt cotton and other plant applications.

Unit III: Various techniques of animal cell and tissue culture:
Culture media, growth factors, laboratory facilities.
Characteristics of cells in culture: Contact inhibition, anchorage dependence, cell-cell communication etc. Cell senescence. Primary culture, immortal cells, types of cell lines. Maintenance of cell lines in the laboratory.

Unit IV: rDNA products:
Brief idea about recombinant DNA products in medicine (insulin, somatostatin, vaccines), Concept of Gene therapy, Production of recombinant vaccines – hepatitis. Concept of transgenic animals, agrobacterium mediated transformation.
In vitro fertilization and embryo transfer in humans and farm animals (Dolly).

Unit V: Intellectual Property Rights:
Patent application, Copy right act, Design act, Trademark act, Patents and their significance, Socio-ethical issues of patenting in biotechnology.
Suggested Books:

PLANT AND ANIMAL BIOTECHNOLOGY

Time: 3 Hours                                                                                        Max. Marks: 75

SECTION –A

Answer and FIVE of the following

1.                                                                                                      5x5=25 Marks
2.                                                                                                      
3.                                                                                                      
4.                                                                                                      
5.                                                                                                      
6.                                                                                                      
7.                                                                                                      
8.                                                                                                      

SECTION – B

Answer any FIVE of the following

11.a)                                                                                                  5X10=50 Marks
   OR
b)                                                                                                      
12.a)                                                                                                  
   OR
b)                                                                                                      
13.a)                                                                                                  
   OR
b)                                                                                                      
14.a)                                                                                                  
   OR
b)                                                                                                      
15.a)                                                                                                  
   OR
b)
UNIT I - HISTORY, SCOPE AND IMPORTANCE (10 hours)

Important contributions - aims and tasks of Bioinformatics - applications of Bioinformatics - challenges and opportunities - internet basics- HTML introduction to NCBI data model- Various file formats for biological sequences

UNIT II - DATABASES - TOOLS AND THEIR USES (15 hours)

Importance of databases - Biological databases-primary sequence databases; Composite sequence databases- Secondary databases- nucleic acid sequence databases - Protein sequence data bases - structure databases - bibliographic databases - specialized genomic resources- analysis packages

UNIT III - SEQUENCE ALIGNMENT METHODS (15 hours)

Sequence analysis of biological data-Significance of sequence alignment pair wise sequence alignment methods- Use of scoring matrices and gap penalties in sequence alignments- multiple sequence alignment methods - Tools and application of multiple sequence alignment.

UNIT IV - PREDICTIVE METHODS USING DNA AND PROTEIN SEQUENCES (10 hours)

Gene predictions strategies - protein prediction strategies - molecular visualization tools- phylogenetic analysis: Concept of trees- phylogenetic trees and multiple alignments.

UNIT V - DRUG DISCOVERY PROCESS (10 hours)

Discovering a drug - target identification and validation - identifying the lead compound - optimization of lead compound - chemical libraries.
I. Answer any FIVE of the following: 5x5=25
   Draw labeled diagrams wherever necessary
   1.
   2.
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   8.

II. Answer any FIVE of the following: 5x10=50
    Draw labeled diagrams wherever necessary
    9.
    OR
    10.
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    OR
CLUSTER ELECTIVE – VIII-B: VI SEMESTER
BIOTECHNOLOGY

PRACTICAL – 1  rDNA TECHNOLOGY

1. Problem in Genetic engineering.
2. Transformation in Bacteria using plasmid.
3. Restriction digestion of DNA and its electrophoretic separation.
4. Ligation of DNA molecules and their testing using electrophoresis.
5. Activity of DNAase and RNAse on DNA and RNA.
6. Isolation of Plasmid DNA.
7. Demonstration of PCR

PRACTICAL -2 PLANTS AND ANIMAL BIOTECHNOLOGY

1. Establishing a plant cell culture (both in solid and liquid media) – seed germination, callus culture, suspension cell culture, regeneration from callus cells.
2. Suspension culture.
5. Establishing primary cell culture of chicken embryo fibroblasts.
6. Animal tissue culture – maintenance of established cell lines
10. IMViC test.
11. Determination of seed viability.

PRACTICAL - III: PROJECT WORK

Associated with Bioinformatics
AP STATE COUNCIL OF HIGHER EDUCATION
w.e.f. 2015-16 (Revised in April, 2016)
BIOCHEMISTRY SYLLABUS FOR VI SEMESTER
Biochemistry Cluster Elective Paper: VIII-C-1
FUNDAMENTALS OF NUTRITION AND FOOD SCIENCE

Hours 60  Marks 100

Unit I: Basic Concepts in Nutrition

1.1 Basic terms used in nutrition
1.2 Understanding relationship between food, nutrition and health
1.3 Functions of food-physiological, psychological and social
1.4 Basic food groups and concept of balanced diet

Unit II Nutrients

Functions, dietary sources and clinical manifestations of deficiency/ excess of the following nutrients:
2.1 Carbohydrates, lipids and proteins
2.2 Fat soluble vitamins-A, D, E and K
2.3 Water soluble vitamins – thiamin, riboflavin, niacin, pyridoxine, folate, vitamin B12 and vitamin C
2.4 Minerals – calcium, iron and iodine

Unit III Food Groups

Selection, nutritional contribution and changes during cooking of the following food groups:
3.1 Cereals
3.2 Pulses
3.3 Fruits and vegetables
3.4 Milk & milk products
3.5 Eggs
3.6 Meat, poultry and fish
3.7 Fats and Oils

Unit IV Methods of Cooking and Preventing Nutrient Losses

4.1 Dry, moist, frying and microwave cooking
4.2 Advantages, disadvantages and the effect of various methods of cooking on nutrients

59
4.3 Minimizing nutrient losses

**UNIT V Basic concepts meal planning**

5.1 Food groups and concept of balanced diet
5.2 Food exchange list
5.3 Concept of Dietary Reference Intakes
5.4 Factors effecting meal planning and food related behaviour.
5.5 Dietary guidelines for Indians and food pyramid
BIOCHEMISTRY MODEL PAPER FOR VI SEMESTER

BIOCHEMISTRY- PAPER - VIII

Cluster Elective Paper: VIII-C-1

FUNDAMENTALS OF NUTRITION AND FOOD SCIENCE

Time: 3 hrs Max. Marks: 75

I. Answer any FIVE of the following: 5x5=25
1. 
2. 
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4. 
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6. 
7. 
8. 

II. Answer any FIVE of the following: 5x10=50

9. 

OR

10. 

OR

11. 

OR

12. 

OR

13.
Unit I Nutrition during childhood
Growth and development, growth reference/ standards, RDA, nutritional guidelines, nutritional concerns and healthy food choices
1.1 Infants
1.2 Preschool children
1.3 School children
1.4 Adolescents

Unit I Nutrition during the adult years
Physiological changes, RDA, nutritional guidelines, nutritional concerns and healthy food choices
2.1 Adult
2.2 Pregnant woman
2.3 Lactating mother
2.4 Elderly

Unit III: Nutritional problems affecting the community
Etiology, prevalence, clinical features and preventive strategies of-
3.1 Undernutrition - Protein energy malnutrition: Severe Acute Malnutrition and Moderate Acute Malnutrition
3.2 Nutritional Anaemias, Vitamin A Deficiency, Iodine Deficiency disorders
3.3 Overnutrition – obesity, coronary heart disease, diabetes
3.3 Fluorosis

Unit IV: Food Adulteration
4.1 PFA definition of food adulteration
4.2 Adulterants in commonly consumed food items
4.3 Accidental contamination: botulism, staphylococcal and aflatoxin intoxication
4.4 Importance of food labels in processed foods and nutritional labelling
4.5 Food laws, regulations and standards

4.6 Codex Alimentarius

- Prevention of Food Adulteration (PFA) Act
- Agmark
- Fruit Products Order (FPO)
- Meat Products Order (MPO)
- Bureau of Indian Standards (BIS)
- MMPO
- FSSAI

Unit V: Social health problems

5.1 Smoking
5.2 Alcoholism
5.3 Drug addiction
5.4 AIDS including AIDS Control Programme
I. Answer any FIVE of the following:  
Draw labeled diagrams wherever necessary  
1.  
2.  
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II. Answer any FIVE of the following:  
Draw labeled diagrams wherever necessary  
9.  
10.  
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12.  
13.  

OR

OR

OR

OR

OR
Unit I: Principles of nutrition care
1.1 Nutrition Care Process
1.2 Therapeutic adaptations of the normal diet
1.3 Progressive diets – clear fluid, full fluid, soft and regular

Unit II: Nutrition for infectious diseases
Etiology, clinical features and nutritional management of Infections and Fevers
2.1 Typhoid
2.2 Tuberculosis
2.3 HIV

Unit III: Nutrition for disorders-1
Etiology, clinical features and nutritional management of the following
3.1 GI Tract Disorders
3.2 Diarrhoea
3.3 Constipation
3.4 Lactose intolerance
3.5 Celiac disease.
3.6 Liver: Infective Hepatitis

Unit IV: Nutrition for disorders-2
Etiology, clinical features and nutritional management of
4.1 Weight Imbalances-Overweight and obesity; Underweight
4.2 Eating disorder- anorexia nervosa and bulimia
Unit V: Nutrition for disorders-3

Etiology, clinical features, basic diagnosis and nutritional management of the

5.1 Type 1 and Type 2 Diabetes Mellitus
5.2 Metabolic Syndrome
5.3 Hypertension and Coronary Heart Disease
I. Answer any FIVE of the following:  
Draw labeled diagrams wherever necessary  
1.  
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II. Answer any FIVE of the following:  
Draw labeled diagrams wherever necessary  
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OR
PRACTICAL – I FUNDAMENTAL OF NUTRITION AND FOOD SCIENCE
1. To develop in students, the concept of portion sizes
2. To impart basic cooking skills and healthy cooking practices
3. Use of food exchange list
4. Planning and preparation of diets and dishes for
   - Young adult
   - Pregnant and Lactating woman
   - Preschool child
   - School age child and adolescents
   - Elderly

PRACTICAL – II NUTRITION FOR THE FAMILY & PUBLIC HEALTH/ THERAPEUTIC NUTRITION
1. Planning, preparation and service of diets for the following:
2. Therapeutic Diets – Normal, Soft, Clear and full fluid
   - Fevers: acute and chronic
   - Obesity
   - Type 2 Diabetes
   - Hypertension and CHD
   - Survey therapeutic foods in market
3. Simple test for food adulteration
4. Assessment of nutritional status:
   - Anthropometry – weight and height measurements
   - Plotting and interpretation of growth charts for children below 5 years
   - Identification of clinical signs of common nutritional disorders
4. Planning of low cost nutritious recipes for infants, pre-schoolers, pregnant/nursing mothers for nutrition education
PRACTICAL - III: PROJECT WORK

1. Market survey of preserved fruit and vegetable product
2. Visit to food testing lab /or any agency of food standards 1
3. Case Study on food safety issues-ICDS/MDM/Diarrheal outbreak/ any other
**Recommended Books for UG Course -Biochemistry**

**General Biochemistry**
8. Biochemistry-Lippincott’s Illustrated Reviews – Champe, P.C. and Harvey, R.A., Lippincott

**Enzymology**
2. Understanding Enzymes – Palmer, T., Ellis Harwood.

**Biochemical Techniques**
2. The Tools of Biochemistry – Cooper, T.G., John Wiley & Sons Press.

**Physiology, Nutrition and Clinical Biochemistry:**
3. Human Physiology – Chatterjee, C.C., Medical Allied Agency

**Immunology:**
1. Immunology, Tizard, I. R. Thomson Press.

**Microbiology:**
16

**Molecular Biology and Biotechnology:**

**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.
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