

UNIVERSITY OF MUMBAI  
No.UG/228 of 2009

CIRCULAR:-

A reference is invited to the Ordinances, Regulations and syllabi relating to the B.Sc. degree course vide this office Circular No.UG/83 of 1999, dated 26<sup>th</sup> February, 1999 and the Principals of the affiliated Colleges in Science are hereby informed that the recommendation made by the Board of Studies in Bio-chemistry at its meeting held on 6<sup>th</sup> April, 2009 has been accepted by the Academic Council at its meeting held on 21<sup>st</sup> April, 2009 vide item No.4.21 and that, in accordance therewith, the syllabus of S.Y.B.Sc. (6 Units) (Theory and Practical) in Bio-chemistry is revised as per Appendix and that the same has been brought into force with effect from academic year 2009-2010.

MUMBAI-400 032  
16<sup>th</sup> June, 2009

PRIN. K. VENKATARAMANI  
REGISTRAR

To, The Principals of the affiliated colleges in Science.

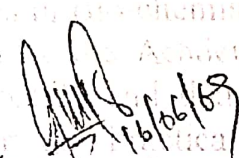
A.C./4.21/21.04.2009

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No. UG/228-A of 2009, MUMBAI-400 032 16<sup>th</sup> June, 2009

Copy forwarded with compliments for information to :

- 1) The Dean, Faculty of Science.
- 2) The Chairperson, Board of Studies in Bio-chemistry.
- 3) The Controller of Examinations.
- 4) The Co-ordinator, University Computerization Center.

  
(D. H. KATE)  
DEPUTY REGISTRAR  
(U.G./P.G.Section)

Copy to :

The Director, Board of College and University Development, the Deputy Registrar (Eligibility and Migration Section), the Director of Students Welfare, the Personal Assistants to the Vice-Chancellor, the Pro-Vice-Chancellor, the Registrar and the Assistant Registrar, Administrative, Ratnagiri for information.

The controller of examinations (10 copies), the Finance and Accounts officer (2 copies), Record Section (5 copies), Publications Section (5 copies), the Deputy Registrar, Enrollment, Eligibility and Migration Section (3 copies), the Deputy Registrar, Statistical, Affiliation Section (2 copies), the Director, Institute of Distance Education, (10 copies) the Director University Computer Center (ITB Building), Vidyanaigari, (2 copies) the Deputy Registrar (Special Cell), the Deputy Registrar, (PRO), The Assistant Registrar, Academic Authorities Unit (2 copies) and the Assistant Registrar, Executive Authorities Unit (2 copies). They are requested to treat this as action taken report on the concerned resolution adopted by the Academic Council referred to in the above Circular and that no Separate Action Taken Report will be sent in this connection. The Assistant Registrar Constituent Colleges Unit (2 copies), BUCT (1 copy), the



# UNIVERSITY OF MUMBAI



Revised Syllabus  
For the  
S.Y.B.Sc.(6 Units)  
(Theory & Practicals)  
in  
Bio-chemistry

**(With effect from the academic year 2009-2010)**



**S.Y.B.Sc. – BIOCHEMISTRY (6 units)**  
**Paper I**

**Biomolecules** : Structure, Function and Basic Principles involved in their Investigation.

**Ist Term**

| Unit No.  | No         | Contents                                                                                                                                                                                                                                                                                                           |            |
|-----------|------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|
|           |            |                                                                                                                                                                                                                                                                                                                    | <b>NOL</b> |
| <b>I</b>  | <b>1.0</b> | <b>Enzymes and Coenzymes</b>                                                                                                                                                                                                                                                                                       | <b>15</b>  |
|           |            | Definition – Enzyme, Apoenzyme, Holoenzyme, Prosthetic group, Active site, Enzyme specificity, Turnover number, Specific activity, Katal, IU, Coenzyme and Cofactor                                                                                                                                                |            |
|           |            | IUB / EC classification upto one digit.<br>Enzyme specificity : Fischer's 'lock & key' and Koshland's 'induced fit' theories                                                                                                                                                                                       |            |
|           | <b>1.3</b> | Activation energy, Mechanism of Enzyme action (concept of active site, single and bi- substrate reaction), Factors affecting enzyme activity – substrate concentration, pH, temperature                                                                                                                            |            |
|           | <b>1.4</b> | Enzyme Kinetics – Derivation of Michaelis - Menten equation and Lineweaver Burke plot for monosubstrate reactions and numerical problems based on them                                                                                                                                                             |            |
|           | <b>1.5</b> | Enzyme inhibition – Reversible and Irreversible; Competitive and Non competitive, one example of each                                                                                                                                                                                                              |            |
|           |            | Problems on entire Unit I                                                                                                                                                                                                                                                                                          |            |
| <b>II</b> | <b>2.0</b> | <b>Hormones and Plant Growth substances</b>                                                                                                                                                                                                                                                                        | <b>15</b>  |
|           | <b>2.1</b> | Definition of Hormones, hormone receptor, endocrine & exocrine glands                                                                                                                                                                                                                                              |            |
|           | <b>2.2</b> | Classification of hormones on the basis of:<br>i) Distance of target tissue- autocrine, paracrine, endocrine<br>ii) Chemistry - One example for each sub class.                                                                                                                                                    |            |
|           |            | Hierarchal organization of the mammalian endocrine system                                                                                                                                                                                                                                                          |            |
|           | <b>2.3</b> | Chemistry & physiological role of thyroxine, oxytocin & vasopressin., Physiological role of glucocorticoids, FSH, LH, Estrogen, Progesterone (Reproductive cycle) Mode of action of steroid hormones and epinephrine. (amplification cascade only till the level of protein kinase A) G protein not to be covered. |            |
|           | <b>2.4</b> | Plant growth substances – Structure and functions of :                                                                                                                                                                                                                                                             |            |

|     |       |                                                                                                                                                                                                                                           |    |
|-----|-------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
|     |       | Auxins, Gibberellins, Cytokinins, Ethylene, and Abscissic acid.                                                                                                                                                                           |    |
| III | 3.0   | <b>Acids, Bases, Buffers and Ionic Equilibria</b>                                                                                                                                                                                         | 15 |
|     | 3.1   | Definition – pH, pK, pK <sub>w</sub> , Isoelectric pH, Buffer, Buffering Capacity                                                                                                                                                         |    |
|     | 3.2   | Derivations : Ionic product of water, Hendersen–Hasselbalch equation, Relation between pI, pK <sub>a1</sub> and pK <sub>a2</sub> for a neutral, acidic and basic amino acid .... {To be done after 3.3.1 is completed}                    |    |
|     | 3.3.1 | Titration and Ionization of Glycine, Lysine and Aspartic acid; pK <sub>a</sub> , pH <sub>M</sub> , and pI values of these amino acid                                                                                                      |    |
|     | 3.4   | Physiological Buffers : (Hb-HHb, Carbonate-Bicarbonate, Phosphate, and Protein                                                                                                                                                            |    |
|     | 3.5   | Numericals on above concepts                                                                                                                                                                                                              |    |
| IV  | 4.0   | <b>Physicochemical Principles -</b>                                                                                                                                                                                                       |    |
|     | 4.1.1 | Explanation of : solute concentration (ways of expressing it- mole, molal, normal, percent), activity & ionic strength,                                                                                                                   |    |
|     | 4.1   | <i>Diffusion and Osmosis</i>                                                                                                                                                                                                              |    |
|     | 4.1.1 | Explanation of : solute concentration (ways of expressing it- mole, molal, normal, percent), activity & ionic strength,                                                                                                                   |    |
|     | 4.1.2 | Diffusion & definition of diffusion coefficient ( factors affecting solute diffusion in solution)                                                                                                                                         |    |
|     | 4.1.3 | Osmosis- Vant Hoff's law of osmotic pressure ( state law & write mathematical expression- no derivation), mechanism of osmosis, Role of osmosis in physiology. Eg. Renal dialysis. Distribution of solute between two immiscible solvents |    |
|     | 4.2   | <i>Colloids and Viscosity</i>                                                                                                                                                                                                             |    |
|     | 4.2.1 | Colloidal state in relation to surface forces , surface area, electrical charge, precipitation and flocculation.                                                                                                                          |    |
|     | 4.2.2 | Surface tension and its measurement, factors affecting surface tension. Eg. Role of bile in digestion                                                                                                                                     |    |
|     | 4.2.3 | Viscosity – definition , measurement; Donnan membrane equilibrium, relation between Donnan equilibrium and osmotic pressure                                                                                                               |    |
| V   | 5.0   | <b>Biochemical Investigation</b>                                                                                                                                                                                                          | 15 |
|     | 5.1   | Approaches to and levels of biochemical investigations                                                                                                                                                                                    |    |
|     | 5.2   | Whole animal and plant studies – the advantages and disadvantages of any four model systems for biochemical investigation (e.g. <i>E.coli</i> , yeast, Dictyostelium, <i>C. elegans</i> , <i>Drosophila</i> , <i>Arabidopsis</i>          |    |



|       |  |                                                                                                                                                |  |
|-------|--|------------------------------------------------------------------------------------------------------------------------------------------------|--|
|       |  | <i>thaliana</i> , <i>Xenopus</i> , rats/mice, Chick embryos, Rabbits/Guinea pigs/ Monkeys)                                                     |  |
| 5.3   |  | Organ & Tissue studies                                                                                                                         |  |
| 5.4   |  | Isolated and cultured tissue and cell techniques : isolation, culture and counting of cells                                                    |  |
| 5.5   |  | Cell Fractionation :                                                                                                                           |  |
| 5.5.1 |  | Cell rupture – solid shear, liquid shear, high pressure, ultrasound, osmotic shock, chemical treatment ( enzyme, organic solvent), temperature |  |
| 5.5.2 |  | Choice of suspension medium ( isotonic & hypotonic solution, PBS) and separation methods                                                       |  |

|    |       |                                                                                                                                                                                                                               |           |
|----|-------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
|    | 6.0   | <b>Microscopy</b>                                                                                                                                                                                                             | <b>15</b> |
| VI | 6.1   | History , Basic principles of microscopy, Concepts of light and colour                                                                                                                                                        |           |
|    | 6.2   | Dissecting and Compound microscope. Construction and parts of a microscope, function of each part, , Levels of magnification, Concept of refractive index and role and RI of oil                                              |           |
|    | 6.3.1 | Specialized Microscopy – Differential interference contrast, ( DIC), Phase contrast, Dark Field                                                                                                                               |           |
|    | 6.3.2 | Specialized Microscopy – ( Fluorescence) : Simple fluorescence, Time-lapse fluorescence, Confocal microscopy, Fluorescence resonance energy transfer, Electron microscopy ( Scanning & Transmission) and Electron microscope. |           |
|    |       |                                                                                                                                                                                                                               |           |

**Term I : Units I, II, III**

**Term II : Units IV, V, VI**

# S.Y.B.Sc. – BIOCHEMISTRY ( 6 units )

## Paper II

### Fundamentals of Genetics and Physiology

| Unit No. | No.   | Content                                                                                                                                                                                                                                                                                                                          | NOL |
|----------|-------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| I        | 1     | <b>Genetics : I</b>                                                                                                                                                                                                                                                                                                              | 15  |
|          | 1.1   | Mendelian genetics: Mendels experiments, Laws of inheritance                                                                                                                                                                                                                                                                     |     |
|          | 1.2   | Incomplete dominance Co-dominance; Epistasis, Maternal effects                                                                                                                                                                                                                                                                   |     |
|          |       | Numericals on above concepts                                                                                                                                                                                                                                                                                                     |     |
| II       | 2.0   | <b>Genetics : II</b>                                                                                                                                                                                                                                                                                                             | 15  |
|          | 2.1.1 | Prokaryotic Genome: Circularity; Single origin                                                                                                                                                                                                                                                                                   |     |
|          | 2.1.2 | Eukaryotic chromosomes: Organization of DNA into chromosomes ( upto Solenoid structure), DNA supercoiling, Topoismerase, Chromatin structure, Euchromatin, Heterochromatin, structure of condensed chromatin, Nucleosomes,[Centromere, kinetochome, telomere], Comparison of chromosomal structure in prokaryotes and eukaryotes |     |
|          | 2.2.1 | Transformation : Definition and transformation in S.pneumoniae                                                                                                                                                                                                                                                                   |     |
|          | 2.2.2 | Transduction : Definition ; Explain general features with one example                                                                                                                                                                                                                                                            |     |
|          | 2.2.3 | Conjugation : Mechanism , $F^+$ , $F^-$ and Hfr strain                                                                                                                                                                                                                                                                           |     |
|          | 2.3   | Cell cycle regulation                                                                                                                                                                                                                                                                                                            |     |
| III      | 3.0   | <b>Transport mechanisms</b>                                                                                                                                                                                                                                                                                                      | 15  |
|          | 3.1   | <i>Across Cell Membrane</i>                                                                                                                                                                                                                                                                                                      |     |
|          | 3.1.1 | Channel proteins and Carrier proteins                                                                                                                                                                                                                                                                                            |     |
|          | 3.1.2 | Active transport ( primary – $Na^+$ & $K^+$ pump ; secondary – Glucose ) & Passive transport ( simple and facilitated diffusion) with suitable examples ; concept of symport and antiport<br>Endocytosis and Exocytosis – with one example each.                                                                                 |     |
|          | 3.2   | <i>In blood-</i>                                                                                                                                                                                                                                                                                                                 |     |
|          | 3.2.1 | Gases- $CO_2$ and $O_2$ - modes of transport, factors affecting the transport, $O_2$ dissociation curves, Chloride shift                                                                                                                                                                                                         |     |
|          | 3.2.2 | Metabolites: lipids- Fatty Acids , Other lipids (lipoprotein-formation, transport, function and degradation )<br>role of plasma proteins in transport.                                                                                                                                                                           |     |
|          | 3.2.3 | Ions : Fe- Ferritin and Transferrin<br>Ca – bound                                                                                                                                                                                                                                                                                |     |



|    |       |                                                                                                                                                                                                                                                                                         |           |
|----|-------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| IV | 4.0   | <b>Locomotion / Movement</b>                                                                                                                                                                                                                                                            | <b>5</b>  |
|    | 4.1   | <b>Muscle contraction</b>                                                                                                                                                                                                                                                               |           |
|    | 4.1.1 | Structural organization of a muscle fibre, myofibril.                                                                                                                                                                                                                                   |           |
|    | 4.1.2 | Contraction and Relaxation of Muscles :- mechanisms, Other types of contractions – eg twitch, tetanus, Isotonic, Isometric Regulation of Muscle contraction                                                                                                                             |           |
|    | 4.2   | <b>Movements in Plants</b>                                                                                                                                                                                                                                                              | <b>5</b>  |
|    | 4.2.1 | <b>Movements of Locomotion</b><br>Spontaneous: Ciliary, Amoeboid, Cyclosis ( Rotation, Circulation)<br>Induced : Chemotaxis, Phototaxis, Thermotaxis                                                                                                                                    |           |
|    | 4.2.2 | <b>Movements of Curvature :</b><br>Mechanical : hygroscopic movements<br>Vital : i) Spontaneous – movements of growth ( nutation, circumutation, Hyponasty, epinasty) ; movements of variation<br>ii) Induced – Tropic - hapto/ geo / hydro tropism ; Nastic – seismonasty , Nyctynasty |           |
|    | 5.0   | <b>Neurophysiology</b>                                                                                                                                                                                                                                                                  | <b>15</b> |
| V  | 5.1   | Nervous System – Classification :CNS , PNS ; Components : Neurons (3 types) and Neuroglia (6 types) – structure and function , Axonal transport                                                                                                                                         |           |
|    | 5.2   | Resting Membrane Potential, ion channels [ voltage and ligand gated ], Action Potential (depolarization, polarization and refraction period), propagation of action potential ( salutatory & continuous conduction)                                                                     |           |
|    | 5.3   | Physiological anatomy of a synapse ; Transmission at synapses – Electrical & Chemical synapses, Excitatory & Inhibitory post synaptic potentials, Agonists & Antagonists, Removal of Neurotransmitters                                                                                  |           |
|    | 5.2   | Neurotransmitters- acetylcholine and Catecholamines, GABA, Glutamate & Aspartate – structure and function                                                                                                                                                                               |           |
| VI | 6.0   | <b>Body Fluids</b>                                                                                                                                                                                                                                                                      | <b>15</b> |
|    |       | <b>Fluid compartments of the body – ICF and ECF</b>                                                                                                                                                                                                                                     |           |
|    | 6.1   | Blood : Composition, characteristics and function ; role of plasma proteins, Starling's hypothesis; blood clotting and factors involved [ no pathway]                                                                                                                                   |           |
|    | 6.2   | Bile : Composition, characteristics and function ; storage                                                                                                                                                                                                                              |           |
|    | 6.3   | Urine : Composition – normal and abnormal constituents; Formation of Urine – concentrated and dilute                                                                                                                                                                                    |           |
|    | 6.4   | Lymph : Composition , Formation and Circulation                                                                                                                                                                                                                                         |           |

Term I ; units I, II, III

Term II : Units IV,V, VI

# S.Y.B.Sc. – BIOCHEMISTRY ( 6 units )

## Paper III - 60 marks

### Fundamentals of Microbiology, Virology, Biotechnology and Resource Management

|     |     |                                                                                                                                                                                                                                                                                                                         |    |
|-----|-----|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
| I   | 1.0 | <b>Introduction to Microbiology and Cell culture</b>                                                                                                                                                                                                                                                                    | 15 |
|     | 1.1 | Sterilization and disinfection techniques                                                                                                                                                                                                                                                                               |    |
|     | 1.2 | Construction of growth media (Natural and Synthetic)                                                                                                                                                                                                                                                                    |    |
|     | 1.3 | An introduction to air , water, soil and food microbiology                                                                                                                                                                                                                                                              |    |
|     | 1.4 | An introduction to Virology : types , structure of genome, plant and animal viruses                                                                                                                                                                                                                                     |    |
|     | 1.5 | <i>Animal Tissue Culture</i> : Introduction, Requirements, Culture techniques (Contamination and Sterilization); Culture media: Stem cell culture; Advantages; Applications-Hybridomas, vaccines                                                                                                                        |    |
|     | 1.6 | <i>Plant Tissue-culture</i> : Introduction; Plant breeding; Techniques for maintenance; Genetic culture techniques: Callus regeneration, mutant selection from culture; Protoplast fusion, Transformation: Applications                                                                                                 |    |
| II  |     | <b>Fermentation and Downstream processing</b>                                                                                                                                                                                                                                                                           | 15 |
|     | 2.1 | <i>Basics</i> : Primary and secondary screening, preparation of inoculum, and fermentation media                                                                                                                                                                                                                        |    |
|     | 2.2 | <i>Fermentors</i> : Types (Batch, Continuous and fluidized bed) and its construction and accessory equipment; Operation of a fermentor; sterilization, inoculation, aeration, agitation;                                                                                                                                |    |
|     | 2.3 | <i>Down-stream processing</i> : Introduction, Separation of particles (solid-liquid), Cell disruption, extraction methods, concentration, Purification and resolution of mixtures, drying                                                                                                                               |    |
| III |     | <b>Industrial Biotechnology</b>                                                                                                                                                                                                                                                                                         | 15 |
|     | 3.1 | <i>Industrial synthesis</i> :<br>Penicillin, Vit B <sub>12</sub> , Cheese, Amylase / Protease ; Ethanol                                                                                                                                                                                                                 |    |
|     | 3.2 | <i>Immobilized enzymes</i> : Introduction; Methods of immobilization (entrapment, adsorption, covalent binding, microencapsulation, cross-linking); Stabilization of soluble enzymes: Solvent and substrate stabilization, Enzyme stabilization by polymer, salts, and Chemical modification; Applications and Problems |    |
|     | 3.3 | <i>Biosensors</i> : Features of biosensors; Types: Electrochemical, Thermometric, Optical, Piezoelectric, Whole cell, Immunobiosensor; Construction and development, Applications                                                                                                                                       |    |
|     | 3.4 | <i>Single cell proteins</i> : Introduction; Bacterial proteins; Yeast proteins; fungal proteins; algal proteins; Economic aspect; Applications                                                                                                                                                                          |    |



|    |       |                                                                                                                                                                                                                                                                                                             |           |
|----|-------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| IV | 4.0   | <b>Trends in Biotechnology:</b>                                                                                                                                                                                                                                                                             | <b>15</b> |
|    | 4.1   | <i>Bioremediation:</i> Introduction; Factors affecting bioremediation; Types; Types of reactions (Aerobic, anaerobic, sequential); Biodegradation of – hydrocarbons, Pesticides and herbicides, heavy metals (Uranium) contaminated soil and waste land; Genetically Engineered Microbes in bioremediation. |           |
|    | 4.2   | <i>Biopesticides:</i> Introduction; Types of biological control (inundation and augmentation); Study related to any two examples from each- viruses, bacteria, fungi and protozoa                                                                                                                           |           |
|    | 4.3   | <i>Biofungicide:</i> herbicides and agricultural antibiotics: Introduction to the terms and any two examples of each                                                                                                                                                                                        |           |
|    | 4.4   | <i>Biofertilizers :</i>                                                                                                                                                                                                                                                                                     |           |
| V  | 5.0   | <b>Introduction to Pharmacology</b>                                                                                                                                                                                                                                                                         | <b>15</b> |
|    | 5.1   | Scope of pharmacology                                                                                                                                                                                                                                                                                       |           |
|    | 5.2   | Sources, Classification and Nomenclature of drugs                                                                                                                                                                                                                                                           |           |
|    | 5.3   | Dosage forms and routes of drug administration; Novel Drug delivery System [NDDS]; Factors affecting dosage and drug delivery                                                                                                                                                                               |           |
|    | 5.4   | Pharmacokinetics : LD 50 , ED 50 Half Life, Loading dose, Maintenance dose ( Explanation of terms only)                                                                                                                                                                                                     |           |
| VI | 6.0   | <b>Resource management</b>                                                                                                                                                                                                                                                                                  | <b>15</b> |
|    | 6.1   | <i>Solid Waste:</i> Types of waste, Treatments, Recycling                                                                                                                                                                                                                                                   |           |
|    | 6.2   | <i>Waste water - Sewage :</i>                                                                                                                                                                                                                                                                               |           |
|    | 6.2.1 | Composition of sewage; Types of sewage; Detection of pathogenic organisms of sewage; Preliminary treatment: Primary treatment; Secondary treatment; Tertiary treatment                                                                                                                                      |           |
|    | 6.2.2 | Disinfection                                                                                                                                                                                                                                                                                                |           |
|    | 6.2.3 | Sludge treatment and disposal                                                                                                                                                                                                                                                                               |           |
|    |       | Waste water collection vs Sewage treatment in developing countries;                                                                                                                                                                                                                                         |           |
|    | 6.3   | <i>Biomass and Bioenergy production:</i>                                                                                                                                                                                                                                                                    |           |
|    | 6.3.1 | <i>Biofuel and Biomass:</i> Fossil fuel; Energy rich crops (sugar & starch; wood-rich; petroleum plants); Animal energy ; Sources of biofuel, its cultivation and extraction process                                                                                                                        |           |
|    | 6.3.2 | <i>Biogas:</i> Production, Composition, Applications, Gobar gas. [MSW and LFG, Renewable natural gas, NG vehicle]                                                                                                                                                                                           |           |

Ist term : Units I, II III

IInd Term : Units IV, V, VI

## **SY.B.Sc BIOCHEMISTRY Practical Syllabus**

### **SY.B.Sc BIOCHEMISTRY PAPER -1**

1. Parts and maintenance of a microscope.
2. A study of electron micrographs of cell organelles.
3. a) Preparation of beta Amylase / Urease / Invertase extract demonstration of the activity Qualitatively.  
b) Determination of the Achromic point of Salivary Amylase.
4. Preparation of Buffers and measurement of pH using pH papers and pH meter.
5. Acid – Base titration of a polyprotic acid [  $\text{H}_2\text{CO}_3$  /  $\text{H}_3\text{PO}_4$  / Glycine hydrochloride]
6. Isoelectric precipitation of Casein using an indicator.
7. A study of some methods of cell rupture :
  - i) effect of hypo, hyper and isotonic solutions on cells of the onion peel./plant cell (Hydrilla/ Vallisneria/ Spirogyra)
  - ii) effect of organic solvents on cell rupture
8. Determination of the Viscosity of sucrose solution using Ostwald's Viscometer.
9. Demonstration of Osmosis through a semi permeable membrane. Potato Osmometer

### **SY.B.Sc BIOCHEMISTRY PAPER – 2**

1. Mendel's Laws : i] Problems based on the laws  
ii] case studies based on the laws
2. A study of Human Karyotypes.
3. Permanent slides of Muscle tissue
4. Blood Experiments : i] Determination of total RBC count  
ii] Determination of total WBC count  
iii] Differential staining of WBC cells  
iv] Bleeding time  
v] Clotting time
5. Urine Analysis : i] Normal constituents - Urea, Uric acid, Chloride



- ii] Abnormal constituents – Glucose, Protein
- iii] Titratable acidity [using neutral red or phenol red]
- 6. Bile : i] Detection of Bilirubin [Iodine test / Gmelin's Nitric acid test / Fouchet's test]
- ii] Detection of Bile salt [ Pettenkofer's test, Hays sulphur test) ]
- 6. Isolation of DNA from Onions
- 8. Demonstration of plant movement . [A project to be handled in a group. Each group to plan and execute the experiment in any way they choose. Results to be presented to the class during a practical turn.]

### **SY.B.Sc BIOCHEMISTRY PAPER – 3 -**

1. Demonstration of the working of an autoclave and a hot air oven.
2. Sterility testing of air by plate exposure technique. [ in sterile zone, in lab, breathed on]
3. A study of various culture inoculation methods . ( streak plate , pour plate and spread plate methods).
4. Determination of the zone of inhibition of microorganisms using the agar well method and disc method.
5. Determination of the Minimum Inhibitory Concentration of any one disinfectant .
6. Determination of the potability of water by conducting a coliform count. [ MPN]
7. Gram stain of sewage.
8. Cell count in a culture medium using optical density.
9. Recrystallization of Benzoic acid and determination of its yield.
10. Preparation of immobilized yeast and its use in determination of invertase activity.
11. Optimization of curd – a demonstration.
12. Flow sheet diagrams of industrial preparation of : a vitamin, an antibiotic, a food item, an enzyme and an alcohol .
13. Determination of the Chemical Oxygen demand of an effluent / sewage.
14. Industrial visit /Assignment for vermiculture, organic farming, composting, biogas plant followed by a detailed report of at least one[ the visit is recommended with the report, but in case it is not possible, an assignment is mandatory]

## References:

### Paper I

1. Textbook of Medical Physiology Gyton and Hall , Elsevier publishers
2. David L. Nelson, Michal M. Cox, Lehniger Principles of Biochemistry, W. H. Freeman & company, New york, 4<sup>th</sup> edition.
3. Murry, R. K. & other, Harper's Biochemistry, Appleton & Lange , california, 21<sup>st</sup> edition.
4. J. L. Jain, Fundamentals of Biochemistry, S. Chand & company, 2005 edition.
5. Dr. A.C. Deb, Fundamentals of Biochemistry, New central book agency (P) Ltd., 8<sup>th</sup> edition.
6. U. Satyanarayanan, Biochemistry, Books & allied (P) Ltd., Kolkata, 3<sup>rd</sup> edition.
7. Murry, R. K. & other, Harper's Biochemistry, Appleton & Lange , california, 21<sup>st</sup> edition.

### Paper II

1. J.B.Russel , Genetics
2. Benamin Lewin, Gene VII , Oxford University Press
3. M.W. Strickberger, Genetics
4. Stanier, Microbiology Pelzer, Essentials of Microbiology
5. Friedfielder, Microbial genetics
6. F.S.K Brar, Essentials of Pharmacology, S . Chand Publisher
7. Upadhyay, Biophysical chemistry, Himalayan Publisher .
8. Keith Wilson & John Walker, Practical Biochemistry, principle and technique, Cambridge University, 5<sup>th</sup> edition
9. William & Wilson
10. Dr. A.C. Deb, Fundamentals of Biochemistry, New central book agency (P) Ltd., 8<sup>th</sup> edition.

### Paper III

1. Microbiology by Stanier
2. Biotechnology, by Primrose , Dube,
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4. A. H. Patel, Industrial microbiology, Macmillan India Ltd.
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