

**BANGALORE UNIVERSITY**  
B.Sc. Biochemistry Syllabus

**I SEMESTER**

**Paper 1.1; Biochemistry-1**

**1. Measurement**

**4h**

**International system of unit** – Derived units. Subsidiary units. Significant figures. Dimensional analysis. Exponential notation. (graphical representation of data Errors in quantitative analysis.

**2. Atomic Structure**

**4h**

Electromagnetic radiation. Wave particle duality - The Broglie equation. The Heisenberg uncertainty principle. The Schrodinger wave equation. Quantum numbers. Atomic orbitals and their shapes. The Pauli's Exclusion principle. Hund's rule. The Aufbau process. Electronic Configuration of the element.

**3. Periodic Classification**

**3h**

Trends in the periodic table atomic radii, ionization energy, electro negativity and electron affinity. Concept of oxidation number and its computation.

**4. Chemical Bonding**

**8h**

Ionic bond-energetics, Born Haber cycle. Covalent bond- Valence bond theory. Hybridization-example; methane, ammonia, water, ethane and ethylene. Sigma and pi bond. Concept of Resonance. Molecular orbital theory. Properties of covalent molecules bond length, bond angle. Polarity of molecules. Coordinate bond. Vander wall's forces. Hydrogen bonds; inter and intra molecular types, importance in biomolecules. Hydrophobic forces.

**5. Radioactivity**

**7h**

Natural and artificial radioactivity. Detection of radioactivity. Characteristics of radio elements. Disintegration constant. Half-life. Tracer techniques-production of labeled C P and compounds and their application in biological studies. Biological effects of radiation emitted by isotopes, safety measures.

## 6. Solutions and Colligative Properties.

6h

Concentration units – molarity, molality, normality and mole fraction. Types of solution, - homogenous and heterogeneous. Factors influencing solubility, solubility curves, Henry Law-applications. Osmotic Pressure and its measurement by the Berkley-Hartley method Laws of osmotic pressure. Hypo-hyper and isotonic solutions. Effect of osmotic pressure on living cells. Donnan membrane equilibrium. Relative lowering of vapour pressure. Raoult's law. Elevation of boiling point, depression in freezing point and their applications in the determination of molecular weight. Abnormal molecular weights. Vant Hoff factor. Degree of association, Degree of dissociation.

## 7. Electrolytic Dissociation and Mass Law

8h

Strong and weak electrolytic. Activity and activity coefficient. Relationship between activity coefficient and ionic strength. Common ion effect, Electrochemical series and applications. Nernst equation. Standard electrode potentials. Electrochemical series and applications. Reference electrodes. Ion selective electrodes and their applications.

## 8. Acids, Bases and Buffers

6h

Modern concepts of acids and bases. Ionisation of acids. Dissociation of water. Ionic product of water. Hydrogen ion concentration-pH. Determination of pH. Dissociation of weak acids. Effects of salt on dissociation of acids. Interaction of acids with bases. Dipolar ions and isoelectric pH of amino acids and proteins. Buffers buffer equation, buffer capacity. Problems on preparation of buffer solutions. Buffers of blood plasma, red blood cells and tissue fluids. Use of buffers. Determination of pH colorimetric method based on use of indicators, limitations. Use buffer solution and indicator.

## 9. Adsorption

3h

Adsorption of gases by solids by solids. Heat of adsorption. Freundlich and Langmuir adsorption isotherm with derivations. Applications of adsorption.

## 10. Biopolymers

3h

Classification. The polymerization process. Number-average and weight-average molecular weights. Molecular weight determination by osmometry and light scattering techniques.

**11. Viscosity of Liquids****2h**

Determination of viscosity of liquids using Oswald's viscometer. Relation of viscosity and shape of molecules. Examples.

**12. Surface tension****1h**

Definition determination of surface tension of liquids using Stainingometer. Effect of surfactants.

**I Semester Biochemistry Practical**

1. Use of analytical balance and Calibration of weights.
2. Cleaning and calibration of glassware.
3. Preparation of standard potassium biphthalate and estimation of alkali.
4. Preparation of standard sodium oxalate and estimation of potassium permanganate.
5. Preparation of standard potassium dichromate solution and estimation of sodium thiosulphate.
6. Estimation of hardness of water using Zinc sulphate solution to be prepared).
7. Gravimetric estimation of sulphate
8. Gravimetric estimation of Magnesium
9. Estimation of nitrogen in biological samples by Microkeldal method

**II SEMESTER****Paper 2.1; Biochemistry-II****1. Introduction****6h**

IUPAC nomenclature of organic compounds including bifunctional ones. Detection and principles of estimation of C-H, N, halogens, S and P in organic compounds. Inductive effect, resonance and hyperconjugation concepts. Reactive intermediates carbocations, carbanions, carbenes and free radicals.

**2. Hydrocarbons****4h**

Mechanism of addition of HCl to proper Markovnikov's rule. Inductive effect Alkenes – ozonolysis and oxidation. Alkenes formation of acetylides and their importance. Dienes: Types with examples. Conjugate dienes. 1,3 Butadiene – Stability, Mechanism of addition of HBr. Conformational analysis of ethane and n-butane.

### 3. Cycloalkanes

2h

Reactivities and relative stabilities. Baeyer strain theory. Sachse-Mohr theory. Boat and chair forms of cycloalkane. Axial and equatorial bonds.

### 4. Arenes

6h

Modern concept of structure of Benzene – Assuming Kekule's structure, Benzene structure according to resonance and molecular orbital theory. Aromaticity and antiaromaticity,  $4n+2$  rule for cycle compounds. Nitration and Friedel Craft's Alkylation (no acetylation). Electronic interpretation of orienting influence of substituents in the electrophilic substitution of toluene, chlorobenzene and nitrobenzene. Structures (inclusive of resonance structures) of naphthalene, anthracene, phenanthrene and diphenyl (no elucidation of structures required). Oxidation reaction of naphthalene to naphthoquinone, phthalic anhydride and phthalic acid.

### 5. Alkyl halides and Organometallic compounds

3h

Alkyl halides- definition with examples, Comparison of primary, secondary and tertiary alkyl halides with reference to  $SN_1$  and  $SN_2$  mechanisms. Mechanistic concepts of elimination ( $E_1, E_2$ ) reactions- t-butyl chloride and n-butyl chloride as examples. Organometallic compounds- definition and examples–(preparations not required) and synthetic applications of Grignard Reagents.

### 6. Alcohols

3h

Definition and classification. Monohydric alcohols-general properties – distinguishing reactions of primary, secondary and tertiary alcohols – Lucas Test, Victor Meyer Test, and Oxidation with reactions. Dihydric alcohols-glycol-structure and uses. Preparations and properties not required. Trihydric alcohol – Glycerol- synthesis from propene. Properties-oxidation, nitration and esterification reactions uses of glycerol.

### 7. Phenols

2h

Definition and classification with structures and examples. Electronic interpretation of acidity of phenol. Mechanisms of Kolber's Reimer-Tiemann reactions. Bromination reaction without mechanism.

### 8. Carbonyl Compounds

**5h**

Definition and examples. General properties with list of reactions-additions of alcohols to aldehydes and ketones. Ketoenol tautomerism. Mechanism: addition of HCN to acetaldehyde, Claisen and aldol condensation. Quinones, o-and p-benzoquinones-structures and properties.

**9. Gases****3h**

Postulates of Kinetic Theory of Gases. Maxwell – Boltzmann distribution law of velocities. Van der Waals equation with terms, no derivation required. Virial Equation with terms, no derivation required. Critical phenomena and determination of critical constants.

**10. Solids****4h**

Types-Crystalline and Amorphous. Size and Shapes. Elements of symmetry. Law of Rational Indices and Miller Indices with simple numericals. Definition of Space Lattice and Unit cell. Crystal systems with examples.

**11. Phase Rule****2h**

Statement, terminology and criterion of phase equilibrium. Application of phase rule to two component system of liquid –Water-Phenol System. Partition coefficient of  $I_2$  between Carbon tetrachloride and water. No numericals. required.

**12. Chemical Equilibrium****4h**

Reversible reactions with examples. Chemical equilibrium – definition and characteristic. Homogeneous and heterogeneous systems with examples. Redox equilibria with example- $Fe^{2+}/Fe^{3+}$  System.

**13. Reaction Kinetics****5h**

Rate equation, Velocity constant-molecularity and order of a reaction – definitions with examples – decomposition of  $PCl_5$  and HI, synthesis of  $NH_3$  and  $SO_3$ . Factors influencing rate of reaction – temperature, pressure, concentration and catalyst. Kinetic Equation of zero ( $k=x/1$ ), first and second order-No derivations required. Expression of second order kinetics-( $a=b$  and  $ab$ ). Arrhenius hypothesis

–equation and its terms only. Activated complex and energy of activation and its terms. Elementary treatment of transition state theory (Graphical representation to be given) Catalysis – characteristics of of catalyst. Types of catalyst-Homo and hetero catalysts with definition and examples. Homogeneous examples-Invertase,  $\text{SO}_3$  formation with nitric oxide. Heterogeneous examples – Haber's Process with Fe, and contact process with Pt. Theory of homogeneous catalysis-intermediate compound formation theory (No mechanisms required) pH dependence of catalyzed reaction –Graphical representation and its example Pepsin. Enzymes as catalysts- simple enzymes-Chymotrypsin, Pepsin, Trypsin. Conjugated Enzymes-Cytochromes.

#### **14. Thermodynamics**

**6h**

Different Statement of first and second laws of thermodynamics. Definition of free energy, free energy change, entropy, chemical potential, standard free energy change of chemical reaction, exergonic and endergonic reactions with examples. Relationship between free energy change and equilibrium constant.

### **II SEMESTER BIOCHEMISTRY PRACTICAL.**

1. Determination of Density and Viscosity of the given organic liquid.
2. Determination of Density and Surface tension of the given liquid.
3. Partition coefficient of iodine between carbon tetrachloride water.
4. Decomposition of hydrogen peroxide in presence and absence of a catalyst.
5. Determination of percentage composition of binary liquid (water/acetic acid) by viscosity method.
6. Reaction Kinetics of Ethyl acetate Hydrolysis.

### **III SEMESTER**

#### **Paqper3.1; Biochemistry-III**

##### **1. Colloids**

**2h**

Types and methods of preparation and purification sob. Electrical properties of colloids. Tyndall effect. Ultra microscope. Brownian movement. Emulsions and emulsifiers Gel. Application of emulsions of in lipid chemistry.

##### **2. Environmental Chemistry**

**5h**

Air pollution and their control-carbon dioxide, sulphur dioxide, oxides of nitrogen and hydrocarbons. Carbon dioxide and the green house effect. Chlorofluorocarbons and the ozone layers. Biochemical toxicity and detoxification of chromium, lead, mercury, cadmium and arsenic. Water pollution BOD and COD. Treatment of sewage and industrial effluent. (tanning and electroplating). Pesticide hazards. Disposal of radioactive wastes.

### **3. Coordination Chemistry**

**4h**

Transition metal ions and oxidation states. Double and complex salt. Werner's and valence bond theories. Geometrical optical isomerism.

### **4. Bioinorganic Chemistry**

**4h**

Metal ions in biological system. Roles of Iron in myoglobin and cytochrome. Copper in haemocyanin. Magnesium in chlorophyll, Cobalt in vitamin B12 and Molybdenum. Metallo-enzyme.

### **5. Photochemistry**

**3h**

Laws of photochemistry, chemiluminescence bioluminescence, photocatalysis and photochemical reaction.

### **6. Identification and separation techniques**

**11h**

Spectroscopy: Application of UV-visible and IR spectroscopy in the identification of common functional groups. Chromatography: General principle. Adsorption –TLC, partition, paper, GLC. Electrophoresis Principle. Paper and seal electrophoresis. Ultra centrifugation: Principle. Sedimentation Method of crystallization and x-ray diffraction-proteins and nucleic acids. NMR and application on Biochemistry.

### **7. Stereochemistry**

**6h**

Stereoisomerism: Types Stereo chemical technology. Optical isomerism: Molecular dissymmetry Chirality glyceraldehydes, lactic and tartaric acid. Nomenclature of enantiomers-The R/S system DL Rotation, racemisation and resolution. Fischer projection formula. Geometrical isomerism: Cis trans isomerism in alkenes and ring compounds. Structure and properties of maleic and fumaric acid(E)-(Z)system of specifying geometrical isomer. Significance of chirality in the biological world.

### **8. Carboxylic Acids**

**3h**

Meaning and usefulness of pK values. Acidity of monocarboxylic acid strength. Hydroxy acid: Preparation and properties of lactic acid. Structure of tartaric malic, citric and isocitric acids. Dicarboxylic acids. Saturated dicarboxylic acids-effect of heat on the first five members. Keto acids Structures of pyruvic,  $\alpha$ -ketoglutaric acids. Properties of pyruvic acid.

## 9. Amines

2h

Classification. Isomerism. Distinguishing reaction of 1<sup>o</sup>, 2<sup>o</sup> and 3<sup>o</sup> amines. pK<sub>b</sub> values of amines. Effect of substituents on the basic strength of amines. Some biologically important amines.

## 10. Heterocyclic Compounds.

2h

Structure formulae and occurrence of furan, pyran, thiophene, thiazole, pyrrole, imidazole, pyridine, pyrimidine, purine, isoalloxazine and indole. Reaction of imidazole and pyridine. Aromaticity of furan, thiophene, Pyrrole and Pyridine.

## 11. Terpene

4h

Isoprene rule. Classification with examples, biological Importance and occurrence of the following: limonene, menthol, santoin, juvenile hormone I, abscisic acid, phytol, gibberic acid, lanosterol, lycopene, polyphenols-dolichols, Steroids, basic ring system. Structure of cholesterol, steroid hormones (testosterone and estradiol). Structure and importance of  $\beta$ -carotene, chlorophyll a, ubiquinone and plastoquinone.

## 12. Alkaloids

3h

Introduction and general characteristics. General method of extraction. Structure and medicinal uses of nicotine, atropine and LSD. Phytochemicals- Introduction and uses.

## 13. Drugs

2h

Chemotherapy. Classification of drug. Synthesis and uses of sulfanilamide, paludrine and pentothal.

## 14. Antibiotics

2h

Definition: Types Sources, structures and antimicrobial spectrum of action of penicillin, chloroamphenicol, streptomycin and tetracyclines.

### **15. Pesticides**

**2h**

Structure and uses of the following insecticides DDT, gammexane lindane allethrin and malathion. Herbicides: 2, 4-D and 2, 4, 5T.

## **III SEMESTER BIOCHEMISTRY PRACTICAL**

1. Systematic qualitative analysis of sample organic compound – alcohol, phenols, carboxylic acids, aldehyde, ketones, esters, aromatic hydrocarbons, halo-compounds, nitro-compounds, amines and amides.
2. Detection of adulterants .

## **IV SEMESTER**

### **Paper4.1; Biochemistry-IV**

#### **1. Introduction**

**2h**

Basic principles of a balanced diet to provide energy and nutrients. Proximate analysis of foods.

#### **2. Digestion**

**5h**

Anatomy of GIT accessory organs. Digestion, absorption and transport of carbohydrates, lipids and proteins.

#### **3. Energy Balance**

**5h**

Calorific value of foods-bomb calorimeter. Respiratory quotient. Basal metabolism. Direct and indirect calorimetry. Basal Metabolic Rate (BMR) and factors affecting it. Specific dynamic action of food. Energy requirements and recommended dietary allowances (RDA) for different physical activities for children and during pregnancy and lactation.

#### **4. Macromolecules**

##### **a) Carbohydrates and lipids**

**3h**

Their role fuel molecules. Sources requirement and storage forms. Protein sparing effect of carbohydrates. Distary fiber. Essential fatty acids and their biological importance.

**b) Proteins**

Their role in the diet. Nitrogen balance. Essential anise acids. Complete and incomplete proteins. Mutual supplementation of proteins. Fortification of foods Protein requirement for different categories. Protein malnutritio.

**5. Micronutrients****a) Vitamins**

Structures; sources daily requirements functions and deficiency symptoms/syndromes of water – soluble vitamins. Hyperpyvimoses. Absorption and transport of fat soluble vitamins.

**b) Minerals****3h**

Macro minerals (Ca,P,Mg,Na,K,Cl) and micro minerals/trace elements(Co, I, Fe, Mn, Zn, and F)-their sources, daily requirements, functions and deficiency diseases symptoms.

**6. Cells and Tissues****3h**

Fine structure of fine animal cell and the function of its organelles. Tissues-epithelial and connective. Collagen and elastin. Bone-composition, growth and remodeling; factors affecting growth.

**7. The Body Fluid****6h**

The intra and extra cellular fluid compartments; distribution of water between the two compartment. The composition and functions of blood, lymph and CSF. Blood brain barrier. Oxygen carrying properties of hemoglobin.

**8. The Liver****2h**

The structure of lobule. Function of liver. Liver function test.

**9. The Kidneys****2h**

The nephron. Formation of urine glomerular filtration, tubular reabsorption and secretion. Renal failure and dialysis.

### **10. Acid-Base balance**

**3h**

Maintenance of normal pH of the body fluids. The buffer systems involved proteins, hemoglobin, bicarbonate and phosphate. The roles of the kidney and lung in maintaining acid base balance.

### **11. The Endocrine system**

**5h**

Classification of hormones on the basis of structure. General mechanism of hormones action membrane receptor and second messenger concept; intracellular receptors and the regulation of genes expression. Functions of the hormones of the hypothalamus (ACTH), the pituitary, the adrenal cortex and medulla, the pancreas, the gonads, the placenta, thyroids and kidneys.

### **12. The nervous system**

**4h**

Neurotransmission; Generalized structure of neuron. Conduction of nerve impulse-membrane and action potentials, synaptic transmission-excitatory and inhibitory Neurotransmitters. Nernst and Goldman Equation.

### **13. Muscle**

**2h**

Types – smooth, striated and cardiac. Contractile and regulatory protein of muscle. The sarcomer, sliding filament model of skeletal muscle contraction.

## **IV SEMESTER BIOCHEMISTRY PRACTICAL**

1. Organic Preparations
  - a) Oxidation-benzoic
  - b) Nitration metadinitiben
  - c) Acetylation-azperine
  - d) Bromination-2,4,6-tromopara bromoacetanilide from acetanitide.
2. Paper chromatography of amino acid and sugar(Ascending descending and circular)
3. Paper electrophoresis for separation of biomolecular.
4. Separation of sugar by T.C
5. Column chromatography of pigments on adsorbents

## V- SEMESTER

### Paper5.1; Biochemistry-V

#### 1. Introduction

2h

Development and scope of Biochemistry, Biochemical composition of living organism, Water as a solvent of life.

#### 2. Carbohydrates

8h

Biological importance and classification. Monosaccharides, D and L designation. Glucose-structural elucidation and conformation. Ring structure of fructose, galactose, mannose and ribose. Straight chair structure of sedoheptulose. Epimers and anomies; ascending and descending of monosaccharide series Derived monosaccharides; structure and descending of monosaccharide series Derived monosaccharide ; structure and biological importance of amino sugars, sugar phosphates, sugar acids and deoxy sugars. Disaccharides, glycoside linkage, Structure and Biological importance of sucrose, maltose, lactose, isomaltose, cellobiose and trehalose polysaccharides: Strong starch and glycogen. Structural cellulose and chitin, Pectin's, glycosaminoglycan, cell wall components peptidoglycan and teichoic acid.

#### 3. Amino Acids

10h

Protein and non-protein amino acids, structure and classification of  $\alpha$ -amino acids, acids-base, chemical and optical properties. Peptides; The peptide bond biologically important peptides. Proteins; Classification based on composition, shape and function, colour reaction. Structural organization- primary, secondary, tertiary and quaternary structures, denaturation.

#### 4. Lipids and Membranes

10h

Classification and biological function.

Fatty acids; classification based on structure, properties of fatty acids. Acyl glycerol; Hydrolysis, Rancidity, acid, saponification and iodine values. Phosphoglycerides; structures and biological roles, Sphingolipids; phosphosphingolipids-sphingomyelins; Glycosphingolipids gangliosides and cerebroside. Prostaglandins; An overview of biological roles, structure of PGE<sub>2</sub> and PGE<sub>3</sub>. Water of biological importance, Lipoproteins; Types and functions, Membranes, Behavior of amphipathic lipids in water, formation of micelles, bilayers and vesicles. Lipoproteins-types and functions. Functions and chemical composition of biological membranes. Fluid mosaic model. Steroids-Function of cholic acid, cholesterol, androgen and estrogens.

## **5. Bioenergetics and biological oxidation** **10h**

Bioenergetics, Energy transformation in living systems, free energy concept. Exergonic and endergonic reaction, ATP and other high energy compounds, energy coupling. Biological oxidation; Step-wise process of biological oxidation, standard reduction potentials of some biochemically important half-reaction, calculation of energy yields from biological oxidation reduction reactions. Mitochondrial electron transport chain-components, schematic representation indicating sites of ATP synthesis. Oxidative phosphorylation - Chemiosmotic theory(an outline).

### **Paper5.2; Biochemistry-VI**

#### **1. Enzymes** **12h**

Characteristic feature, classification, specificity, active site. Theories of interaction between active sites and substrate. Enzyme assays and International Units.

Enzymes Kinetics: Factors affecting the rate of enzymes-catalyzed reaction-enzymes concentration, substrate concentration, Michaelis-Menten Equation, pH, and temperature. Significance of  $K_m$  and  $V_{max}$  and their determination using Lineweaver-Burk plots.

Enzyme inhibitor, reversible and irreversible, Reversible- Competitive, non-competitive, uncompetitive inhibition with graphical representations using L-B plots. Brief mention of allosteric enzymes and isoenzymes. Biotechnological and clinical application of enzymes.

#### **3. Nucleic acids** **10h**

Components of nucleic acids nucleosides, nucleotides, and polynucleotides, Occurrence and isolation of nucleic acids. Properties of nucleic acids, Chemical synthesis of oligonucleotides. DNA: Biological role, structure, polymorphism, denaturation, Renaturation, Structural organization of prokaryotic and eukaryotic DNA Nucleoproteins. RNA: Types and biological role structure of RNA, nucleoproteins.

#### **4. Mutations** **3h**

Types- base substitution, mis-sense, frame shift mutation. Mutagens and mutagenesis.

#### **5. Molecular Biology** **15 h**

Introduction: DNA replication semi-conservative mode of replication, and experimental verification. Enzymes and regulatory proteins involved in replication. An outline of the mechanism of action of prokaryotic DNA polymerases. RNA Biosynthesis-initiation, elongation, and termination, reverse

transcription-HIV replication. RNA polymerase , Comparison of RNA polymerase. Comparison of RNA polymerases with DNA polymerases. The genetic code-general features. Ribosomes. Protein synthesis (prokaryotic); Activation of amino acids, initiation, elongation, and termination. Properties of amino acyl tRNA synthetases. Post transcriptional process. Introduction to operon concept; *lac*-operon. Replication, transcription and translation as targets for antibiotic action.

## V SEMESTER BIOCHEMISTRY PRACTICAL

1. Qualitative analysis of carbohydrates amino acids, proteins, lipids, preparation of solid derivatives of monosaccharides – osazones(5 units).
2. Estimation of amino acids by formal titration.
3. Estimation of ascorbic acid from biological samples by titrimetric method.
4. Determination of iodine value of a lipid.
5. Estimation of Calcium from milk.
6. Preparation of starch from potato, casein, iron, milk and extraction of oil from oil

## VI SEMESTER

### Paper 6.1; Biochemistry-VII

#### 1. Introduction to metabolism 2h

Anabolism, catabolism, stages in catabolism, compartmentalization of metabolic pathways in cells and energy conservation.

#### 2. Carbohydrates metabolism 2h

Glycolysis entry of other carbohydrates into glycolysis, the fate of pyruvate, the citric acids cycle, the energetics of glucose metabolism. Enzymatic control of glycolysis and TCA cycle. Outline of pentose phosphate pathway and its significance. The Cori cycle, outline of gluconeogenesis and glycogen metabolism. The amphibipathic and integrating role of the citric acids cycle. Substrate level phosphorylation, regulation of blood sugar level. Diabetes mellitus. Glycogen storage disorder and Cori disease.

#### 3. Lipid Metabolism 9 h

The  $\beta$ -oxidation pathway even and odd numbers, saturated and unsaturated fatty acids. Structure and function of fatty acyl synthase. Energetics of total oxidation. General scheme of biosynthesis of fatty acids. Outline of cholesterol biosynthesis. Ketone bodies, atherosclerosis.

### 3. Amino acids metabolism

9h

General reaction of amino acids metabolism- transamination, deamination and decarboxylation. The Urea cycle and its regulation. Biosynthesis of glycogen, alanin cysteine and aspartic acid.

Biosynthesis of biologically active amines-epinephrine.

Non- epinephrine. Histamine and poly amines. Disorders of amino acid metabolism PKU and AKU.

### 5. Nucleic Acid metabolism

4h

Biosynthesis and regulation of purine and pyrimidine nucleotides. Metabolic disorders. Orotic acid urea and Gout.

### 6. Photosynthesis

4h

The photosynthesis apparatus and pigments. Outlines of light and dark reactions  $C_3$  and  $C_4$  plants.

## VI SEMESTER BIOCHEMISTRY PRACTICAL-VII

1. Colorimetric estimations;
  - a) Protein by F-C method,
  - b) Iron using anion
  - c) Phosphate by Fiske
  - d) Creatinine in urine
  - e) Blood sugar by Folic method
  - f) Estimation of lactose in milk
2. Determination of the equivalent conductivity of an electrolyte.
3. Conductometric titration of an amino acid against hydrochloric acid and sodium.

## VI BIOCHEMISTRY PRACTICAL

### Enzymes

1. Preparation of buffer and determination of pH (acetate-pH5.0; phosphate pH8.0)
2. Determination of the amylase activity in saliva of Effect of time on amylase activity.
3. Effect of temperature and pH on the activity of the salivary amylase.
4. Assay of phosphates from potato/green gram.
5. Qualitative analysis of body fluids such as blood (urea, total count, plasma volume). And urine (pH, odor, colour, sp. Gravity, proteins, blood, sugar)
6. Estimation of glucose by Hagedorn-Jensen method.
7. Determination of acidity of urine.

## **Paper 6.2; Biochemistry –VIII**

### **1. Microscopy**

**2h**

the compound microscope and its uses. Brief mention on electron microscope and applications.

### **2. Classification of micro organizations**

**2h**

Eubacteria, archeobacteria, fungi, protozoa and viruses

### **3. Bacterial cell structure**

**6h**

Ultra structure and composition of cell wall, chromosomes, plasmid, ribosomes, cell membrane, flagella (Motility) capsule and spores. Gram-stain classification of bacteria as Gram positive and Gram negative, Spore stains.

### **4. Viruses**

**5h**

Brief account of animal viruses polio, influenza, HIV; plant viruses –TMV and bacteriophage T-even (Mature and infected cycle)

### **5. Cultivation of micro organizations**

**4 h**

Nutritional requirements, temperature, pH and oxygen consideration for optimal growth curve, control of microorganism by chemical and physical method.

### **6 Microbial technology**

**3h**

Use of microorganism in- a) fermentation – production of ethanol baker's yeast and penicillin, b) biodegradation of sewage, c) Single cell protein-spirulina.

### **7. Immunology**

**10h**

Innate and acquired immunity, antigen, antigenic determinants and heptenes, T and B-lymphocytes, cellular and humeral immunity, immune globulin-classes, and function, structure of IgG, Antigen-antibody reaction, allergy, vaccines, ABO blood group, blood typing.

### **8. Introduction to Recombinant DNA Technology**

**8h**

Enzymes used in recombinant DNA technology; Vectors, chimeric DNA molecules, introduction of recombinant DNA molecules in host cells. Selection of transformed cells. Libraries and library construction. Probes, blotting and hybridization techniques. Application of recombinant DNA technology. Insulin production.

**BIOCHEMISTRY PRACTICAL-VIII**

1. Washing and sterilization of glassware.
2. Preparation of media-plates, stab, slant, slant.