SRI VENKATESWARA UNIVERSITY

BIOTECHNOLOGY

3-2-102

B. Sc. I – SEMESTER II – W.E.F. 2015-16

BT 201 BIOCHEMISTRY

UNIT I

Nucleic Acids and Chromosomes

Chemical structure and base composition of nucleic acids, Chargaff's rules, Watson Crick Model (B-DNA), deviations from Watson-Crick model, other forms of DNA (A- and Z-DNA), forces stabilizing nucleic acid structures, (hydrogen bonds and hydrophobic associations, base stacking). Maxam and Gilbert DNA sequencing, structure of t-RNA.

Concept of prokaryotic genes and eukaryotic genes: Definition of a gene, concept of split genes, introns, exons, spacers, C-value and C-value paradox, basic idea of Cot curves.
Chromatin structure: Nucleosome structure (10 nm fibre, experiments leading to discovery of nucleosomal structure, types of histones, arrangement of histones in the octamer, H1 histone and its role, role and length of linker DNA), 30 nm fibers (arrangement of nucleosome in a helical structure), domain and loop structure (further compacting of 30 nm fibre, role of scaffolding proteins). Role of telomere and centromere, telomeric and centromeric repeat sequences.

UNIT II

Amino acids and Proteins

Amino acids: Structure of amino acids occurring in proteins, classification of amino acids (pH based, polarity based and nutrition based), Physico-chemical properties of amino acids (solubility, boiling and melting points, reactions like Edman's, Sanger's, Dansyl chloride, ninhydrin). Titration curves of neutral, basic and acidic amino acids.
Primary structure of proteins: Determination of primary structure (end group analysis, cleavage of disulfide bonds, amino acid composition, use of endopeptidase specificity, sequence determination, assignment of disulfide position).

Secondary structure of proteins: The α-helix, β-structures (parallel, antiparallel, mixed, β-turn).
Tertiary structure of proteins: Forces that stabilize the structure (electrostatic forces, hydrogen and disulfide bonds, hydrophobic associations), myoglobin as an example of tertiary structure, concept of domains, protein denaturation.
Quaternary structure of proteins: Forces stabilizing quaternary structure, advantages of oligomeric proteins.

UNIT III:

Carbohydrates

Definition, classification, nomenclature of carbohydrates, structures of monosaccharides, disaccharides and polysaccharides (structures of starch and glycogen as examples of homopolysaccharides). Concept and examples of heteropolysaccharides. Outlines of metabolism of carbohydrates and their in born errors of metabolism

Lipids

Types of lipids, structures of saturated and unsaturated fatty acids, triglycerides, phospholipids, plasmalogens, gangliosides and sphingolipids. Terpenoids and isoprenoids - definition and representative structures, steroids. Concept of acid value, saponification value and iodine value. Outlines of metabolism of fatty acids, cholesterol, steroids and products of poly unsaturated fatty acids.

UNIT IV

Enzymes

Terminology: Active site, allosteric site, Holoenzyme, apoenzyme, coenzyme, substrate, inhibitor, activator, modulator etc.Classification and nomenclature. Concept of isoenzymes (example Lactate Dehydrogenase) and multienzymes (example pyruvate dehydrogenase) Substrate Specificity (bond specificity, group specificity, absolute specificity, stereo-specificity, proof-reading mechanism), lock and key and induced fit models.

Concept of allosteric enzymes (brief idea of ATCase as an example , Mechanisms of catalysis: Acid-base, covalent and metal ion catalysis.

Assay of Enzymes: Concept of activity, specific activity, turnover number, units of enzyme activity (katal, international unit), spectrophotometric methods of assay of enzymes (simple and coupled assay), very brief idea of other methods.

Enzyme kinetics: Michaelis-Menten equation, effect of substrate concentration, effect of enzyme concentration, effect of Ph and temperature, temperature quotient, single reciprocal(Eadie-Hoffstee equation) and double reciprocal plots(Lineweaver-Burke plots), enzyme inhibition kinetics (reversible inhibition types – competitive, uncompetitive and non-competitive), brief idea of irreversible inhibition.

UNIT V

Bioenergetics: Concept of free energy, Entropy, Enthalpy & Redox Potential. Concept of high energy bonds as related to the structure of ATP, Phosphoenolpyruvate, Creatine phosphate etc.

Glycolysis (pathway, entry of other monosachharides and disaccharides, regulation, inhibitors) Gluconeogenesis: Bypass reactions.

Structure of mitochondria.

Metabolism of Nitrogenous Compounds

Transamination (mechanism). Oxidative & Non-oxidative deamination.

Urea cycle: Detailed account, linkage of urea & TCA cycle, compartmentation of urea cycle, regulation, metabolic disorders of urea cycle.

Transmethylation & Decarboxylation, physiologically important products of decarboxylation. Biosynthesis of purines and pyrimidines: Salvage pathways.

B.Sc. I SEMESTER II PRACTICALS
BIOTECHNOLOGY
BT 202 Macromolecules & Enzymology

1. Formol titration of glycine.
2. Quantitative Estimation of proteins by Biuret method
3. Determination of albumin & A/G ratio in serum.
4. Estimation of DNA by Diphenylamine method
5. Estimation of RNA by Orcinol method
6. Quantitative estimation of amino acids using Ninhydrin reaction.
7. Qualitative Analysis of sugars and proteins.
8. Quantitative estimation of sugars (Dinitrosalicylic acid method).
9. Estimation of glucose by Benedict's quantitative method
10. Quantitative estimation of proteins by Lowry's method.
11. Extraction and quantification of total lipids.
12. Determination of saponification value of Fats
13. Determination of Acid Value of Fats
14. Isolation of urease and demonstration of its activity
15. Assay of protease activity.
16. Preparation of starch from Potato and its hydrolysis by salivary amylase.
17. Assay of alkaline phosphatase
18. Immobilization of enzymes / cells by entrapment in alginate gel
19. Effect of temperature / pH on enzyme activity

*** Minimum of Ten practicals are mandatory**

BSc I BIOTECHNOLOGY
Semester II
MODEL QUESTION PAPER
COURSE CODE: BT 201
COURSE NAME: BIOCHEMISTRY

Time 3 Hrs Marks 75

Attempt any *five* questions from Part A and *all* questions from Part B
PART A (5x3=15 Marks)

Note: At least one question must be set from each UNIT

1. Structure of Purine
2. C Value paradox
3. Edman Reaction
4. Pka values
5. Structure of Galactose
6. Properties of terpinoids
7. Lock and Key hypothesis
8. Reduction of Oxygen

PART B (5x12=60 Marks)
Answer the following

9 (a) Explain the forces involved in DNA structure

Or

(b). What are histones? Discuss their nature

10 (a) Write on the titration curves of acidic aminoacids.

Or

(b) Describe the secondary structures of proteins.

11 (a) What is meant by in born error? Discuss at least two disorders related to carbohydrates.

Or

(b) Explain with suitable examples on classification of aminoacids.

12 (a) Define isoenzyme. Explain on the isoenzymes of LDH

Or

(b) Discuss on the derivation of Michaelis Menten Equation

13 (a) Write on energy conversion in chemical reaction. Write on energy rich molecules.

Or

(b) Discuss in detail on TCA cycle.