

503. Biochemistry

Unit 1: Statistics and Quantitative Problems in Biochemistry

Measures Of Central Tendency – Mean, Median And Mode Of Grouped Data, Variance, Standard Deviation, Standard Error, Graphical Representation Of Data, Correlation And Regression Probability In Biology, Normal, Binomial, Poisson Distribution

Student's T-Test, Chi-Square Test.

Aqueous Solutions (Molarity, Molality And Normality), Acid And Bases, Buffers, Calculation Of Equilibrium Constants, Oxidation and Reduction Reactions, Radioactivity (Specific Activity Half Life And Isotope Dilution And Dual Labeling) And Beer Lamberts Laws. Enzyme Units And Specific Activity Of Enzymes, Km And Vmax, Enzyme Inhibitors.

Unit 2 : Biochemical Techniques And Bioinformatics

Principles, Instrumentation and Applications Of VIS, UV Fluorescence Spectroscopy.

Separation Methods: Chromatography And Electrophoresis; Principles And Applications Of Different Types Of Chromatography (Partition, Adsorption, Ion Ex Change, Affinity Etc.). Instrumentation And Applications Of HPLC, GC, Atomic Absorption Spectroscopy And MS (MALDI-TOF). Principle And Applications Of Electrophoresis. Agarose and SDS PAGE. Disc Gel Electrophoresis, Isoelectric focusing, 2D Electrophoresis, Capillary Electrophoresis And PFGE. DNA Sequencing And Transfer Techniques.

Use Of Databases; Data Mining, DNA Sequence Databases, Protein Sequence And Structure Databases, Comparing DNA Sequences, Alignment, Multiple Sequence Alignments, Clustalw.

Genomics; HUGO & HGP; Strategies For Sequencing Genomes, Shotgun Sequencing, Physical Maps, Ests And Hierarchical Sequencing Micro-Arrays For Sequencing And Resequencing, Snps And Human Disease.

Proteomics: Comparing Protein Sequences, Alignment, Predicting Secondary Structure – *Ab Initio*, Homology Folding, Threading. MS

Unit 3 : Cell Biology And Biomolecules

Cell Division And Cell Cycle, Fundamental Aspects Of Cell Culture, Apoptosis, Stem Cells And Their Medical Applications, Discovery Of Oncogenes, Proto-Oncogenes, Discovery Of Tumor Suppressor Genes.

Cell Communication And Type Of Signaling Molecules (Hydrophobic And Hydrophilic), Types Of Receptors And Their Structures, Second Messengers – Ca, Phosphoinositides, And Camp.

Metabolism; Carbohydrate, Lipid And Nuclei Acid Metabolism. Associated Disorders.

Immunonology ; Overview And Elements Of Immune System, Antibodies - Structure Of Ig, Function Of Various Domains, Antigen Antibody Interactions – Avidity, Affinity, Idiotypes, Generation Of Antibody Diversity, Cytokines, Interferons And Autoimmunity,

Unit 4: Molecular Biology

Replication Transcription And Translation In Prokaryotes And Eukaryotes: Models Of Replication – Random, Conservative, Semiconservative, DNA Polymerases In *E. Coli* & Mammals, Replication Of Circular Chromosomes - λ 174, *E. Coli* Replication Of Linear Chromosomes, Telomeres, Telomerases. DNA Damage, Repair and Recombination.

Transcription And Translation, Protein Synthesis, Sorting, Targeting And Degradation.

Regulation Of Gene Expression; Operon Concept, +Ve & -Ve Control -Lac Operon, Chromatin Structure In Active And Inactive Regions – DNA Methylation, Transcriptional Control – Cell Specific Expression - Promoters, Enhancers, DNA Binding Proteins, Regulation By Si RNA.

Recombinant DNA Technology: Plasmids And Vectors, DNA Modifying Enzymes, Restriction Endonucleases, Genomic And Cdna Libraries, Reporter Genes And Fusion Proteins.