

## SYLLABUS FOR THE POST OF LECTURER 10+2 BIO-TECHNOLOGY

1. Cellular diversity – An overview.
2. Structure of Prokaryotic and Eukaryotic cells.
3. Cellular organelles-Plasma membrane, cell wall, Mitochondria, Chloroplast, Nucleus and other organelles; their structural organization.
4. Transport of nutrients, ions and macromolecules across membranes, endocytosis, phagocytosis & pinocytosis, Vesicular transport & secretory pathways.
5. Cellular energy transaction-Role of mitochondria and chloroplast.
6. Cell cycle-molecular events and regulatory controls, cell cycle checkpoint with emphasis on animal cells & yeast cell divisions.
7. Cancer: Types, causes, molecular basis of cancer cell behaviour.
8. Chemical foundation of Biology-pH, pK, acids, bases, buffers, weak bonds (hydrogen bonding, hydrophobic, hydrophilic, Vander waals bonding and ionic interactions) covalent bonds, Water: physical properties and structure of water.
9. Principles of thermodynamics-concept of free energy, Gibbs Helmholtz equation, free energy and equilibrium constants, free energy and electrode (Cell) potential.
10. Carbohydrates – Definition, Nomenclature, Classification, Occurrence, characteristics and Biological significance. Structure and conformation of sugars. Stereoisomerism and optical isomerism. Chemical reactions of functional groups present in carbohydrates, Amino sugars. Structure and function of homo-and-hetero-polysaccharides. Mucopolysaccharides and Proteoglycans. Types of glycoproteins-N and O linked glycosylations. Polysaccharides-Types, structural features, methods for compositional analysis.
11. Proteins: structure and conformation of proteins. Secondary structures. Prediction of secondary structure of proteins. Ramachandran plots. Tertiary structure of proteins and forces stabilizing the tertiary structure. Mechanism of protein folding – Chaperons.
12. Fatty Acids: Definition, nomenclature and properties. Saturated and unsaturated fatty acids. Essential fatty acids. Classification of lipids. Chemical composition of fats, Properties of glycerides.
13. Pure culture techniques, theory & practice of sterilization, growth curve, synchronous growth, continuous culture, Growth as effected by environmental factors like Temperature, Acidity, Alkalinity, water availability and oxygen, culture collection and maintenance of cultures.
14. Prokaryotic cells: structure function. Cell wall of eubacteria (Peptidoglycan) and related molecules; Outer membrane of Gram negative bacteria; cell wall and cell membrane synthesis; Flagella and motility; cell Inclusions like endospores, gas vesicles.
15. Transformation, conjugation, Transduction, Recombination, Plasmids and Transposons. Bacterial genetic maps with reference to E-Coli. Brief introduction to life cycle and molecular biology of some important pathogens; of Hepatitis, Tuberculosis, HIV.
16. Carbohydrate Metabolism: Glycolysis, TCA cycle, pentose phosphate pathway, Glucuronate pathway, Gluconeogenesis. Glycolysis, TCA cycle, pentose phosphate pathway, Gluconeogenesis. Glycogen metabolism and its regulation. Hormonal control of carbohydrate metabolism.

17. Basic principles of centrifugation, types of centrifugation, differential centrifugation, density gradient centrifugation, materials used for making density gradient.
18. Basic principles & types of electrophoresis, Agarose gel electrophoresis, PAGE, SDS-PAGE and isoelectric focussing.
19. Blotting techniques like Southern and Western blotting & their applications in molecular biology.
20. Brief description & tabulation of data & its graphical representation.
21. Measures of central tendency & dispersion; mean, median, mode, range, standard deviation, variance. Idea of two types of errors and level of significance, test of significance (F& t-test); chisquare tests.
22. Simple linear regression and correlation.
23. Introduction to computers; Organization; low level & high-level languages; binary number systems. Introduction to MS-Office (word Processing, spreadsheets & presentation software).
24. Introduction to Internet & its applications.
25. Replication of DNA: direction and methods of replication, replication in prokaryotes, chromosomal replication, Topoisomerases-I and II in replication. Replication forks, Eukaryotes.
26. Messenger RNA biosynthesis in prokaryotes-RNA Polymerase & promoter, specificity, initiation. Elongation & termination of transcription. Transcriptional repression & de-repression, operon concept (Lac).
27. Eukaryotic transcription, RNA polymerase, general & specific transcription factors, regulatory elements & mechanism of transcription regulation, RNA processing & stability.
28. Prokaryotic & Eukaryotic translation, the translational machinery, mechanism of initiation, elongation & termination, regulation of translation, Co- and post-translational modification of proteins. Degeneracy of genetic code, wobble hypothesis Genetic code in Mitochondria.
29. Properties of enzyme as catalytic power, specificity cofactor. Briefly nomenclature and classification of enzymes, isoenzymes.
30. Determination of primary secondary, tertiary & quaternary structure of proteins/enzyme, folding & unfolding of enzymes.
31. Phylogeny of immune system. Innate and acquired Immunity. Clonal nature of Immune response.
32. Organization and structure of lymphoid organs. Antibody structure and function. Major histocompatibility complex. Complement system.
33. Cells of immune system: Hematopoiesis & differentiation, Lymphocyte trafficking, B-Lymphocyte, T-Lymphocyte, Macrophages, Dendritic cells, Natural Killer and Lymphokine activated killer cells, Eosinophils, Neutrophils and Mast cells. Hybridoma technology and Monoclonal Antibodies.
34. Environment: Basic concepts and issues. Environment Pollution: types of pollution, Methods for the measurement of pollution; Methodology of environmental management – the problem solving approach, its limitations. Water pollution and its control; water as scarce natural resource, Need for water collection, waste water treatment, physical chemical and biological treatment processes.
35. Microbiology of wastewater treatment, Aerobic: Activated sludge, oxidation, ditches, trickling filter and towers, rotating discs, rotating drums, oxidation ponds.

36. Scope, Milestones and Guidelines of genetic engineering. Gene cloning vectors: Plasmids, Bacteriophages, phagemids, Cosmids, YACs and BACs Cloning of foreign DNA, klenow filling, Ligation (Blunt end and cohesive end). Polymerase chain reaction. Library construction and screening: c-DNA and Genomic libraries.
37. Introduction to cell and tissue culture: Totipotency of plant cells. Initiation and maintenance of callus and suspension culture. Organogenesis: Somatic embryogenesis, Synthetic seeds. Protoplast isolation, culture and fusion; selection of hybrid cells and regeneration of hybrid plants; Symmetric and Asymmetric hybrids, Cybrids.
38. Plant transformation Technology; Binary vectors, use of 35S and other promoters, use of Reporter genes and selectable markers. Applications of transgenic plants.