Syllabus for M. Tech.-Biotechnology

General Science (30 Marks) 15 x 2

Biostatistics:
Probability, Major of central tendency and dispersion: Mean, Median, Mode, standard deviation, standard error of mean, skewness, kurtosis; Testing of hypothesis: Z-statistics, t-statistics, F-statistics, correlation regression, chi-square test

Physics:
Laws of thermodynamics, Concept of entropy, Applications to compression and expansion processes. Solution thermodynamics - Excess properties of mixtures, Concept of free energy,

Chemistry:
Concept of pH and buffer, Chemical bonding and hybridization, Atomic and molecular structure, Chemical reaction equilibrium, Chemical reaction mechanism (SN1 and SN2), Chemical kinetics (first & second order)

Computer Science:
Introduction to logic (binary, decimal, hexa decimal number conversions), Flow diagram.

Biological Sciences: 70 marks (35 x 2)

Biochemistry

Biomolecules and their conformation; Enzyme kinetics; Bioenergetics; Metabolism (Glycolysis, TCA and Oxidative phosphorylation); Membrane transport and pumps; Cell cycle and cell growth control; Cell signaling and signal transduction, Basic immunology, Types of immunity, T-cells and B-cells, Antigen-antibody reaction, Antibody structure, T-cell receptors, Complement system, Autoimmunity, Hyper-sensitivity, Hybridoma technology, Vaccines

Microbiology
Prokaryotic and eukaryotic cell structure; Microbial nutrition, growth and control; Microbial metabolism (aerobic and anaerobic respiration, photosynthesis); Microbial genetics (plasmids, transformation, transduction, conjugation); Microbial diversity and characteristic features; Viruses, Host-pathogen interactions, role of microbes in industry

Molecular Biology and Genetics

Cell division, Central dogma of molecular biology, DNA as genetic material, Structure of DNA and RNA, Physical and chemical properties of nucleic acids, DNA super coiling, Basic techniques of molecular Biology, DNA damage and repair, DNA replication, Gene structure in prokaryotes and eukaryotes, DNA transcription and RNA processing, Genetic code and protein synthesis, Gene regulation, Post-translational modifications, Mutations and their role in Evolution, Population genetics, Genetic disorders

Introduction to Bioinformatics

Biological databases, sequence retrieval and analysis (NCBI & BLAST), Sequence alignment (Pairwise and Multiple sequence alignment), Construction of phylogenetic trees, Gene predictions, RNA and protein structure prediction

Recombinant DNA Technology:
Restriction and modification enzymes; Vectors: plasmid, bacteriophage and other viral vectors, cosmids, Ti plasmid, yeast artificial chromosome; cDNA and genomic DNA library; Gene isolation; Gene cloning; Expression of cloned gene; Transposons and gene targeting; DNA labeling; DNA sequencing; Polymerase chain reactions; DNA fingerprinting; Southern and northern blotting; In-situ hybridization; RAPD; RFLP; Site-directed mutagenesis; Gene transfer technologies; Gene therapy.

Basic techniques in biotechnology

Principle and application of microscopy; filteration; centrifugation; spectroscopy (UV/Visible, NMR,IR), Electrophoresis; chromatography(TLC,HPLC,GC, ion exchange, affinity, gel filteration); lyophilization.