GRADUATE APTITUDE TEST-BIOTECHNOLOGY (GAT-B) 2020

The examination will be conducted in a single shift for a duration of 180 minutes. The question paper will have two parts:

PART- A: Part A will have 60 compulsory multiple choice questions of the level of 10+2 in the subjects: Physics, Chemistry, Mathematics and Biology. Each correct answer will be of one mark each. There will be negative marking and for each wrong answer, ½ (half) mark will be deducted.

PART-B: Part B will have multiple choice questions of bachelor's level requiring thinking and analysis. There will be questions from basic Biology, Life Sciences, Biotechnology and allied areas as per syllabus given below. There will be 100 questions out of which the candidates will have to attempt 60 questions. Each correct answer will have a weightage of 3 marks. There will be negative marking and for each wrong answer one mark will be deducted.

PART-B SYLLABUS

General Biotechnology

Biochemistry: Biomolecules-structure and functions; Biological membranes, structure, action potential and transport processes; Enzymes- classification, kinetics and mechanism of action; Basic concepts and designs of metabolism (carbohydrates, lipids, amino acids and nucleic acids) photosynthesis, respiration and electron transport chain; Bioenergetics

Microbiology: Viruses- structure and classification; Microbial classification and diversity (bacterial, algal and fungal); Methods in microbiology; Microbial growth and nutrition; Aerobic and anaerobic respiration; Nitrogen fixation; Microbial diseases and host-pathogen interaction

Cell Biology: Prokaryotic and eukaryotic cell structure; Cell cycle and cell growth control; Cell-Cell communication, Cell signalling and signal transduction

Molecular Biology and Genetics: Molecular structure of genes and chromosomes; Mutations and mutagenesis; Nucleic acid replication, transcription, translation and their

regulatory mechanisms in prokaryotes and eukaryotes; Mendelian inheritance; Gene interaction; Complementation; Linkage, recombination and chromosome mapping; Extra chromosomal inheritance; Microbial genetics (plasmids, transformation, transduction, conjugation); Horizontal gene transfer and Transposable elements; RNA interference; DNA damage and repair; Chromosomal variation; Molecular basis of genetic diseases

Analytical Techniques: Principles of microscopy-light, electron, fluorescent and confocal; Centrifugation- high speed and ultra; Principles of spectroscopy-UV, visible, CD, IR, FTIR, Raman, MS,NMR; Principles of chromatography- ion exchange, gel filtration, hydrophobic interaction, affinity, GC,HPLC, FPLC; Electrophoresis; Microarray

Immunology: History of Immunology; Innate, humoral and cell mediated immunity; Antigen; Antibody structure and function; Molecular basis of antibody diversity; Synthesis of antibody and secretion; Antigen-antibody reaction; Complement; Primary and secondary lymphoid organ; B and T cells and macrophages; Major histocompatibility complex (MHC); Antigen processing and presentation; Polyclonal and monoclonal antibody; Regulation of immune response; Immune tolerance; Hypersensitivity; Autoimmunity; Graft versus host reaction.

Bioinformatics

Major bioinformatics resources and search tools; Sequence and structure databases; Sequence analysis (biomolecular sequence file formats, scoring matrices, sequence alignment, phylogeny); Data mining and analytical tools for genomic and proteomic studies; Molecular dynamics and simulations (basic concepts including force fields, protein-protein, protein-nucleic acid, protein- ligand interaction)

Recombinant DNA Technology

Restriction and modification enzymes; Vectors; plasmid, bacteriophage and other viral vectors, cosmids, Ti plasmid, yeast artificial chromosome; mammalian and plant expression vectors; cDNA and genomic DNA library; Gene isolation, cloning and expression ; 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

Plant and Animal Biotechnology

Totipotency; Regeneration of plants; Plant growth regulators and elicitors; Tissue culture and Cell suspension culture system: methodology, kinetics of growth and, nutrient optimization; Production of secondary metabolites by plant suspension cultures; Hairy root culture; transgenic plants; Plant products of industrial importance

Animal cell culture; media composition and growth conditions; Animal cell and tissue preservation; Anchorage and non-anchorage dependent cell culture; Kinetics of cell growth; Micro & macro-carrier culture; Hybridoma technology; Stem cell technology; Animal cloning; Transgenic animals

Bioprocess Engineering and Process Biotechnology

Chemical engineering principles applied to biological system, Principle of reactor design, ideal and non- ideal multiphase bioreactors, mass and heat transfer; Rheology of fermentation fluids, Aeration and agitation; Media formulation and optimization; Kinetics of microbial growth, substrate utilization and product formation; Sterilization of air and media; Batch, fed-batch and continuous processes; Various types of microbial and enzyme reactors; Instrumentation control and optimization; Unit operations in solid-liquid separation and liquid-liquid extraction; Process scale-up, economics and feasibility analysis

Engineering principle of bioprocessing - Upstream production and downstream; Bioprocess design and development from lab to industrial scale; Microbial, animal and plant cell culture platforms; Production of biomass and primary/secondary metabolites; Biofuels, Bioplastics, industrial enzymes, antibiotics; Large scale production and purification of recombinant proteins; Industrial application of chromatographic and membrane based bioseparation methods; Immobilization of biocatalysts (enzymes and cells) for bioconversion processes; Bioremediation-Aerobic and anaerobic processes for stabilization of solid / liquid wastes