Graduate Aptitude Test – Biotechnology (GAT-B) – Syllabus

For admission to DBT supported Post Graduate (DBT PG) Programme in Biotechnology at participating host institutions and universities.

The question paper for GAT-B will have two sections:

Section A: Section A will have 60 compulsory multiple choice questions of the level of 10+2in the subjects: Physics, Chemistry, Mathematics and Biology. Each correct answer is of One (1) mark. There will be negative marking and for each wrong answer, Half (1/2 or 0.5) mark will be deducted.

Section B: Section B will have multiple choice questions of Bachelor's (Graduate) level requiring thinking and analysis. There will be questions from Basic Biology, Life Sciences, Biotechnology andallied areas as per syllabus given here. There will be 100 questions out of which candidates will have to attempt 60 questions. Each correct answer is of Three (3) marks. There will be negative marking and for each wrong answer, One (1) mark will be deducted.

Un-answered/un-attempted question will be given Zero (0) mark.

To answer a question, candidate needs to choose one option as correct option.

GRADUATE APTITUDE TEST-BIOTECHNOLOGY (GAT-B)			
Sections	**Number of Questions**	**Number of Questions to be attempted**	**Marks**
Section A (Multiple choice questions of 10+2 level in the subjects: Physics, Chemistry,Mathematics and Biology).	60	60	1*60 = 60
Section B (Multiple choice questions of Graduate level in the subjects: Basic Biology, Life Sciences, Biotechnology and allied areas as per syllabus given here).	100	60	3*60 = 180
Total	**160**	**120**	**240**

Syllabus for Section A is of 10+2 level in the subjects of Physics, Chemistry, Mathematics and Biology.

Syllabus for Section B is of Graduate level as given here:

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.

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-pathogeninteraction.

Prokaryotic and eukaryotic cell structure; Cell cycle and cell growth control; Cell-Cell communication, Cell signaling and signal transduction.

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, genetics (plasmids, transformation, transduction, conjugation); Horizontal gene transfer and Transposable elements; RNA interference; DNA damage and repair; Chromosomal variation; Molecular basis of genetic diseases.
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.

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.

Major bioinformatics resources and search tools; Sequence and structure databases; Sequence analysis (bimolecular 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).

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.

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.

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 bio-separation methods; Immobilization of biocatalysts (enzymes and cells) for bioconversion processes; Bioremediation-Aerobic and anaerobic processes for stabilization of solid / liquid wastes.

Tissue culture and its application, Micropropagation. Meristem culture and production of virus-free plants. Anther and microspore culture. Embryo and ovary culture. Protoplast isolation. Protoplast fusion-somatic hybrids, cybrid. Somaclones, Synthetic seeds. In vitro germplasm conservation. Cryopreservation. Organelle DNA, Satellite-and repetitive DNAs. DNA repair. Regulation of gene expression. Recombinant DNA technology-cloning vectors, restriction enzymes, gene cloning. Methods of gene transfer in plants. Achievements and recent developments of genetic engineering in agriculture. Development of transgenics for biotic & abiotic stress tolerance, bioethics, terminator technology, nanotechnology, DNA fingerprinting, gene silencing.

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