

## PGT (Biotechnology) Syllabus

### Unit 1: Biotechnology: An overview

#### Chapter 1: Introduction to Biotechnology

- Historical Perspectives
- Production Strategies in Biotechnology
- Quality Control
- Product Safety
- Good Manufacturing Practices
- Good Laboratory Practices
- Intellectual Property
- Public Perception
- Global market
- Biotechnology in India and Global Trends

### Unit-II: Molecules of Life

#### Chapter 1: Biomolecules: Building Blocks

- Building Blocks of Carbohydrates
  - Sugars and Their Derivatives
- Building Blocks of Proteins
  - Amino Acids
- Building Blocks of Lipids
  - Simple Fatty Acids
  - Sphingosine
  - Glycerol
  - Cholesterol
- Building Blocks of Nucleic Acids
  - Nucleotides
  - Biochemical Transformations

#### Chapter 2: Macromolecules: Structure & Function

- Carbohydrates - The Energy Givers
- Proteins - The Performers
- Enzymes - The Catalysts
- Lipids and Biomembranes - The Barriers
- Nucleic Acids - The Managers

### Unit III: Genes and Genomes

#### Chapter 1: Gene Structure and Function

- Cell Structure and Components
- Tissues and Organs
- Stem cells
- Biodiversity
- Organization of Life

#### Chapter 2: Genomes Organization & Function

- Cell Division
- Cell Cycle
- Cell Communication
- Movement
- Nutrition
- Gaseous Exchanges
- Internal Transport
- Maintaining the Internal Environment
- Reproduction
- In vitro Fertilization
- Animal and Plant Development
- Immune Response in Animals
- Programmed Cell Death
- Defense Mechanisms in Plants

### Unit IV: Cells and Organisms

#### Chapter 1: Cells: The Basic Unit of Life

- Historical Perspective
- Multiple Alleles

- Linkage and Crossing Over
- Genetic Mapping
- Gene Interaction
- Sex-Linked Inheritance
- Extranuclear Inheritance
- Quantitative Inheritance
- Genes at Population Level
- Discovery of DNA as Genetic Material
- Mutations
- DNA Repair
- Genetic Disorders

## **Chapter 2: Organisms: Structure & Dynamics**

- Genome Organization
- DNA Replication
- Fine Structure of Genes
- From Gene to Protein
- Transcription - The Basic Process
- Genetic Code
- Translation
- Regulation of Gene Expression

## **Unit V: Protein and Gene Manipulation**

### **Chapter 1: Recombinant DNA Technology**

- Introduction
- Tool of rDNA technology
- Making rDNA
- Introduction of recombinant DNA into host cells
- Identification of recombinants
- Polymerase chain reaction (PCR)
- Hybridization techniques
- DNA library
- DNA sequencing
- Site-directed mutagenesis

### **Chapter 2: Protein Structure and Engineering**

- Introduction to the world of proteins
- 3-D shape of proteins
- Structure-function relationship in protein
- Purification of proteins
- Characterization of proteins
- Protein based products
- Designing proteins (protein engineering)

### **Chapter 3: Genomics and Bioinformatics**

- Introduction
- Genome sequencing projects
- Gene prediction and counting
- Genome similarity
- SNPs and comparative genomics
- Functional genomics
- Proteomics
- History of bioinformatics
- Sequences and nomenclature
- Information sources
- Analysis using bioinformatics tools

## **Unit VI: Cell Culture and Genetic Manipulation**

### **Chapter I: Microbial Culture and Applications**

- Introduction
- Microbial culture techniques
- Measurement and kinetics of microbial growth
- Scale up of microbial process

- Isolation of microbial products
- Strain isolation and improvement
- Applications of microbial culture technology
- Biosafety issues in microbial technology

## **Chapter II: Plant Cell Culture and Applications**

- Introduction
- Cell and tissue culture techniques
- Applications of cell and tissue culture
- Gene transfer methods in plants
- Transgenic plants with beneficial traits
- Biosafety in plant genetic engineering

## **Chapter III: Animal Cell Culture and Applications**

- Introduction
- Animal cell culture techniques
- Characterization of cell lines
- Methods of gene delivery into cells
- Scale-up of animal culture process
- Applications of animal cell culture
- Stem cell technology
- Tissue engineering