BIOTECHNOLOGY

(Subject Code-045)

Syllabus for Purpose of Examinations 2021-22

CLASS- XI (2021-22)
COURSE STRUCTURE (THEORY)

Units	Term-I	Marks
Unit-I	Biotechnology: An Overview	5
Unit-II	Molecules of Life	20
Unit-III	Genetics and Molecular Biology	10
	Term-II	
Unit-III	Genetics and Molecular Biology (Contd.)	10
Unit-IV	Cells and Organisms	25
	Practical (Term-I) (Term-II)	15 15
	Total	100

CLASS XI
(Theory)

Total Marks: 70 (Term I+II)

TERM-I

Unit-I Biotechnology: An overview **5 Marks**

Chapter 1: Biotechnology: An Overview

Historical Perspectives, Technology and Applications of Biotechnology, Global market and Biotech Products.

Unit-II Molecules of Life **20 Marks**

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, Glycerol and Cholesterol, Building Blocks of Nucleic Acids – Nucleotides.

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 Genetics and Molecular Biology **10 Marks**

Chapter 1: Concepts of Genetics

Historical Perspective, Multiple Alleles, Linkage and Crossing Over, Genetic Mapping.

TERM-II

Unit-III Genetics and Molecular Biology

Chapter 2: Genes and Genomes: Structure and Function **10 Marks**

Discovery of DNA as Genetic Material, DNA Replication, Fine Structure of the Genes, From Gene to Protein, Transcription – The Basic Process, Genetic Code, Translation, Mutations, Human Genetic Disorders.

Unit IV: Cells and Organisms **25 Marks**

Chapter 1: The Basic Unit of Life

Cell Structure and Components, Organization of Life

Chapter 2: Cell Growth and Development

Cell Division, Cell Cycle, Cell Communication, Nutrition, Reproduction, Immune Response in animals

PRACTICALS

Term-I **15 Marks**

Practical should be conducted alongside the concept taught in theory classes

1. Preparation of buffers and pH determination
2. Sterilization techniques
3. Preparation of bacterial growth medium
4. Cell counting

The scheme of evaluation at the end of term will be as under:

One experiment	:	10 Marks
Marks viva on experiments	:	05 Marks

Term-II **15 Marks**

1. Sugar Estimation using Di Nitro Salicylic Acid test (DNS test)
2. Assay for amylase enzyme
3. Protein estimation by biuret method

The scheme of evaluation at the end of term will be as under:

One experiment	:	10 Marks
Marks viva on experiments	:	05 Marks

CLASS- XII (2021-22)

COURSE STRUCTURE (THEORY)

Units	Term-I	Marks
Unit-V	Protein and Gene Manipulation	35
	Term-II	
Unit-V	Protein and Gene Manipulation (Continued)	05
Unit-VI	Cell Culture and Genetic Manipulation	30
	Practicals	
	Term-I	15
	Term-II	15
	Total	**100**

TERM-I

Unit-V Protein and Gene Manipulation **35 Marks**

Chapter-1: Recombinant DNA Technology

Introduction, Tool of DNA technology, Making of rDNA molecule, Introduction of recombinant DNA into host cells, Identification of recombinants, Polymerase Chain Reaction (PCR), DNA Sequencing.

Chapter-2: Protein Structure and Engineering

Introduction to the world of proteins, Structure-function Relationship in proteins, Characterization of proteins, Protein based products, Designing proteins (Protein Engineering)

Chapter-3: Genomics, Proteomics and Bioinformatics

Gene prediction and counting, Genome similarity, SNPs and Comparative genomics, Functional genomics, Proteomics,

TERM-II

Unit-V Protein and Gene Manipulation

Information sources, Analysis using bioinformatics tools. 05 Marks

Unit-VI Cell Culture and Genetic Manipulation **30 Marks**

Chapter-1: Microbial Cell Culture and its Applications

Introduction, Microbial nutrition and culture techniques, Measurement and kinetics of microbial growth, Isolation of microbial products, Strain isolation and improvement, Applications of microbial culture technology.

Chapter -2: Plant Cell Culture and Applications

Introduction, Cell and tissue culture techniques, Applications of cell and tissue culture, Transgenic plants with beneficial traits, Biosafety of transgenic plants

Chapter-3: Animal Cell Culture and Applications

Introduction, Animal cell culture techniques, Applications of animal cell culture, Stem cell technology.

PRACTICAL

Term-I

15 Marks

Practical should be conducted alongside the concept taught in theory classes

1. Use of special equipment in biotechnology experiments
2. Isolation of bacterial plasmid DNA
3. Detection of DNA by gel electrophoresis
4. Estimation of DNA by UV spectroscopy
5. Reading of a DNA sequencing gel to arrive at the sequence
6. Project Work

Note:- More emphasis should be given on hands on working projects.

The scheme of evaluation at the end of term will be as under:

A	One experiments	06
	Practical record	02
	Viva on Practical	02
B	Project Work	05
	Total	15

Term-II

15 Marks

1. Isolation of bacteria from curd & staining of bacteria
2. Cell viability assay using Evan's blue dye exclusion method
3. Data retrieval and database search using internet site NCBI and download a DNAand protein sequence from internet, analyze it and comment on it
4. Project Work

The scheme of evaluation at the end of term will be as under:

A	One experiments	06
	Practical record	02
	Viva on Practical	02
B	Project work	05
	Total	15

Note:- More emphasis should be given on hands on work in projects.

Prescribed Books:

1. **A Text Book of Biotechnology -** Class XI : Published by CBSE, New Delhi
2. **As reference- Biotechnology -** Class XI : Published by NCERT, New Delhi
3. **A Laboratory Manual of Biotechnology -** Class XI : Published by CBSE, New Delhi
4. **A Text Book of Biotechnology -** Class XII : Published by CBSE, New Delhi
5. **A Laboratory Manual of Biotechnology -** Class XII : Published by CBSE, New Delhi

Assessment Areas (Theory) 2021-22
Classes XI-XII
Biotechnology (045)

Competencies	
Demonstrate Knowledge and Understanding	50%
Application of Knowledge / Concepts	30%
Analyse, Evaluate and Create	20%

Note:

- Internal choice would be provided.

Suggestive verbs for various competencies

- **Demonstrate, Knowledge and Understanding**

  State, name, list, identify, define, suggest, describe, outline, summarize, etc.

- **Application of Knowledge/Concepts**

  Calculate, illustrate, show, adapt, explain, distinguish, etc.

- **Analyze, Evaluate and Create**

  Interpret, analyse, compare, contrast, examine, evaluate, discuss, construct, etc.