BIOTECHNOLOGY
(Subject Code-045)
Syllabus for Purpose of Examinations 2021-22

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

<table>
<thead>
<tr>
<th>Units</th>
<th>Term-I</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit-I</td>
<td>Biotechnology: An Overview</td>
<td>5</td>
</tr>
<tr>
<td>Unit-II</td>
<td>Molecules of Life</td>
<td>20</td>
</tr>
<tr>
<td>Unit-III</td>
<td>Genetics and Molecular Biology</td>
<td>10</td>
</tr>
</tbody>
</table>

Term-II

<table>
<thead>
<tr>
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<th>Marks</th>
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<tbody>
<tr>
<td>Unit-III</td>
<td>Genetics and Molecular Biology (Contd.)</td>
<td>10</td>
</tr>
<tr>
<td>Unit-IV</td>
<td>Cells and Organisms</td>
<td>25</td>
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<tr>
<td></td>
<td>Practical (Term-I)</td>
<td>15</td>
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<tr>
<td></td>
<td>(Term-II)</td>
<td>15</td>
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<td>Total</td>
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</tbody>
</table>

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

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  
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  
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  
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  
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  
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)

<table>
<thead>
<tr>
<th>Units</th>
<th>Term-I</th>
<th>Marks</th>
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<tbody>
<tr>
<td>Unit-V</td>
<td>Protein and Gene Manipulation</td>
<td>35</td>
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<tr>
<td></td>
<td><strong>Term-II</strong></td>
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<tr>
<td>Unit-V</td>
<td>Protein and Gene Manipulation (Continued)</td>
<td>05</td>
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<tr>
<td>Unit-VI</td>
<td>Cell Culture and Genetic Manipulation</td>
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<tr>
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<td><strong>Practicals</strong></td>
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<td>Term-I</td>
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<td>15</td>
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**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:

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<td>A</td>
<td>One experiments</td>
<td>06</td>
</tr>
<tr>
<td></td>
<td>Practical record</td>
<td>02</td>
</tr>
<tr>
<td></td>
<td>Viva on Practical</td>
<td>02</td>
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<tr>
<td>B</td>
<td>Project Work</td>
<td>05</td>
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<td></td>
<td>Total</td>
<td>15</td>
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**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 DNA and 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:

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**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)**

<table>
<thead>
<tr>
<th>Competencies</th>
<th>Weightage</th>
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<tbody>
<tr>
<td>Demonstrate Knowledge and Understanding</td>
<td>50%</td>
</tr>
<tr>
<td>Application of Knowledge / Concepts</td>
<td>30%</td>
</tr>
<tr>
<td>Analyse, Evaluate and Create</td>
<td>20%</td>
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**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.