10. BIOTECHNOLOGY (Code No. 045)

An unprecedented growth of human knowledge in the field of Biological Sciences coupled with equally significant developments in the field of technology have brought significant changes into existing social and economic systems. The emerging field of Biotechnology is likely to further enhance the applications of Science and Technology in the service of human welfare. Modern Biotechnology processes encompass a wide range of new products such as antibiotics, vaccines, monoclonal antibodies and many more. Furthermore, developments in recombinant DNA technology have yielded numerous new useful products in the fields of healthcare and agriculture. The present syllabus takes care of all these aspects. Due emphasis has been laid on familiarizing the learners with the fundamental concepts, basic techniques and their applications. It is expected that the knowledge gained through the study of different topics and the skills acquired through the prescribed practical work will make the learners competent to meet the challenges of academic as well as professional courses after studying the subject at senior secondary stage.

Objectives

The broad objectives of teaching Biotechnology at senior secondary level are:

- To help the learners know and understand basic facts and concepts of the subject at elementary stage.
- To expose the students to different basic processes and basic techniques used in Biotechnology.
- To familiarize the learners to understand the relationship of the subject to health, nutrition, environment, agriculture, industry, etc.
- To develop conceptual competence in the learners so as to cope up with professional courses in future career.
- To acquaint students with different applications of biotechnology in everyday life.
- To develop an interest in students to study biotechnology as a discipline.

CLASS XII (2017-18)
(THEORY)
COURSE STRUCTURE

One Paper **Max. Marks 70+30**

Time: 3 hrs.

Units		No. of Periods	Marks
Unit-V	Protein and Gene Manipulation	100	40
Unit-VI	Cell Culture and Genetic Manipulation	80	30
	Practicals	60	30
Total		**240**	**100**

One paper Time: 3 hrs.

Total Marks: 70 **180 Periods**

Unit-V Protein and Gene Manipulation **40 Marks 100 Periods**

Chapter-1: Recombinant DNA Technology

Introduction, Tools of Recombinant DNA technology, Making Recombinant DNA, 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 Proteins, Purification of proteins, Characterization of proteins, Protein Based products, Designing proteins (protein engineering)

Chapter-3: Genomics, Proteomics 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 **30 Marks 80 Periods**

Chapter-1: Microbial Cell Culture and Its Applications

Introduction, Microbial culture techniques, Measurement and kinetics of microbial growth, Scale-up of microbial process, Isolation of microbial products, Strain isolation, improvement and Preservation, Applications of microbial culture technology, Biosafety Issues in microbial technology

Chapter-2: 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 of Transgenic Plants.

Chapter-3: Animal Cell Culture and Applications

Introduction, Animal cell culture techniques, Characterisation 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

PRACTICALS 30 Marks 60 Periods

Note: Every student will be required to do the following experiments during the academic session.

List of Experiments

1. Use of special equipment in biotechnology experiments.
2. Isolation of bacterial plasmid DNA
3. Detection of DNA by gel electrophoreses
4. Isoloation of Genomic DNA (CTAB method)
5. Estimation of DNA
6. Bacterial transformation using any plasmid
7. Restriction digestion of plasmid DNA & its analysis by gel electrophoreses
8. Isolation of bacterial grom curd & staining of bacteria
9. Cell viability assay
10. Data retreival and data base search using internet site NCBI and download a DNA and protein sequence from internet, analyse it and comment on it
11. Reading of a DNA sequencing gel to arrive at the sequence
12. Project work

Scheme of Evaluation:

Time: 3 Hours **Max. Marks 30**

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

A	Two experiments	6+6 (only one computer based practical)
	Practical record	04
	Viva on Practicals	04
B	Project work	
	Write up	05
	Viva on project	05
	Total	**30**

Prescribed Books:

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

BIOTECHNOLOGY (CODE - 045)
QUESTION PAPER DESIGN
Class - XII (2017-18)

Time 3 Hours **Max. Marks: 70**

S. No.	Typology of Questions	Very Short Answer (VSA) (1 mark)	Short Answer-I (SA-I) (2 marks)	Short Answer-II (SA-II) (3 marks)	Long Answer (L.A.) (5 marks)	Total Marks	% Weightage
01	Knowledge Based	2	1	2	1	15	22%
02	Conceptual Understanding (Application and Reasoning based)	3	4	8	1	40	57%
03	Higher Order Thinking Skills (HOTS)	1	2	-	-	05	07%
04	Skill Based	-	1	1	1	10	14%
	Total	**6**	**8**	**11**	**3**	**70**	**100%**

Total No. of questions = 28

1. *No chapter wise weightage. Care to be taken to cover all the chapters.*
2. *The above template is only a sample. Suitable internal variations may be made for generating similar templates keeping the overall weightage to different form of questions and typology of questions same.*