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

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CLASS XII (2019-20)
COURSE- STRUCTURE-(THEORY)

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

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

Chapter-1: Recombinant DNA Technology

Introduction, Tool of DNA technology, Making 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

Chapter-1: Microbial Cell Culture and its Applications

Introduction, Microbial Nutrition and 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

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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, 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

PRACTICALS **30 Marks**

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

1. Use of special equipment in biotechnology experiments
2. Isolation of bacterial plasmid DNA
3. Detection of DNA by gelelectrophoreses
4. Isolation of Genomic DNA (CTAB method)
5. Estimation of DNA
6. Bacterial transformation using any plasmid
7. Restriction digestion of plasmid DNA & its analysis by gelelectrophoresis
8. Isolation of bacteria from curd & staining of bacteria
9. Cell viability assay
10. Data retrieval and database search using internet site NCBI and download a DNA and protein sequence from internet, analyze 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 Practical	04
B	Project work	
	Write up	05
	Viva on project	05
	Total	30

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QUESTION PAPER DESIGN
Class – XII (2019-20)

1) Board Examination – Theory

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

S. No.	Typology of Questions	VSA (1 Marks)	SA-I (2 Marks)	SA-II (3 marks)	LA (5 marks)	Total Marks	Percent -age
1.	**Remembering-** Exhibit memory of previously learned material by recalling facts, terms, basic concepts, and answers.	5	1	2	1	9 (18)	25.7%
2.	**Understanding-** Demonstrate understanding of facts and ideas by organizing, comparing, translating, interpreting, giving descriptions and stating main ideas	4	1	2	1	8 (17)	24.3%
3.	**Applying:** Solve problems to new situations by applying acquired knowledge, facts, techniques and rules in a different way.	3	1	1	1	6 (13)	18.5%
4.	**Analyzing & Evaluating:** Examine and break information into parts by identifying motives or causes. Make inferences and evidence to support generalizations Present and defend opinions by making judgment about information, validity of ideas or quality of work based on a set of criteria.	2	2	1	1	6 (14)	20%
5.	**Creating:** Compile information together in a different way by combining elements in a new pattern or proposing alternative solutions	1	2	1	-	4 (8)	11.5%
	TOTAL	15x1=15	7x2=14	7x3=21	4x5=15	70	

2) Practical : 30 marks Duration : 3 hours