BOARD OF SCHOOL EDUCATION HARYANA

Syllabus and Chapter wise division of Marks (2025-26)

Class: XI **Subject: Biotechnology** **Code: 871**

General Instructions:

1. There will be an Annual Examination based on the entire syllabus.
2. The Annual Examination will be of 60 marks, Practical Examination will be of 20 marks and 20 marks weightage shall be for Internal Assessment.
3. For Practical Examination:
   - i) Two experiments of 6 marks each.
   - ii) One activity of 3 marks.
   - iii) Practical record of 2 marks.
   - iv) Viva-voce of 3 marks.
4. For Internal Assessment:
   There will be Periodic Assessment that would include:
   - i) For 6 marks- Two SAT exams will be conducted and will have a weightage of 04 marks towards the final Internal Assessment.
   - ii) For 2 marks- One half-yearly exam will be conducted and will have a weightage of 02 marks towards the final Internal Assessment.
   - iii) For 2 marks- Subject teacher will assess and give maximum 02 marks for CRP (Classroom participation).
   - iv) For 5 marks- A project work to be done by students and will have a weightage of 05 marks towards the final Internal Assessment.
   - v) For 5 marks- Attendance of student will be awarded 05 marks as:

75% to 80% - 01 marks
80% to 85% - 02 marks
85% to 90% - 03 marks
90% to 95% - 04 marks
95% to 100% - 05 marks

Course Structure (2025-26)

Class- XI **Subject-Biotechnology** **Code:871**

Sr. no	Unit	Chapter	Marks
1	Biotechnology: An Overview	Biotechnology: An Overview	5
2	Molecules of Life	Biomolecules: Building Blocks	18
		Macromolecules: Structure and Function	
3	Genetics and Molecular Biology	Concepts of Genetics	17
		Genes and Genomes: Structure and Function	
4	Cells and Organisms	The Basic Unit of Life	20
		Cell Growth and Development	
Total			60
Practical Examination			20
Internal Assessment			20
Grand Total			**100**

Unit I: BIOTECHNOLOGY: AN OVERVIEW

Chapter 1: Biotechnology: An Overview

Historical Perspectives: Microorganisms as causative agents of fermentation; **Technology and applications of Biotechnology:** Bioprocessing Technology, Cell Culture, Recombinant DNA Technology, Cloning, Protein Engineering, Biosensors, Nanobiotechnology; **Global Market of Biotech Products:** Public Perception of Biotechnology; **Biotechnology in India and Global Trends:** Indian scenario, Global scenario

Unit II: MOLECULES OF LIFE

Chapter 1: Biomolecules: Building Blocks

Building Blocks of Carbohydrates - Sugars and Their Derivatives: Properties of sugars; **Building Blocks of Proteins -Amino Acids:** Properties of amino acids; **Vitamins and coenzymes; Building Blocks of Lipids -- Simple Fatty Acids; Sphingosine; Glycerol and Cholesterol:** Properties of lipids; **Building Blocks of Nucleic Acids** – Nucleotides: Properties of nucleotides; Biochemical Transformations: Carbohydrate metabolism: Overview of Metabolism- Catabolism, Anabolism and ATP, Catabolism of glucose and other hexoses, Photosynthesis: Calvin cycle of CO_2 assimilation, Photorespiration, Nitrogen Fixation: Nitrogenase, Nitrogen fixation and organic farming

Unit II: MOLECULES OF LIFE

Chapter 2: Macromolecules: Structure and Function

Carbohydrates-The Energy Givers; Proteins - The Performers: Protein structure, Determination of amino acid sequences – Primary structure, Sequencing strategies, Protein secondary structures- alpha –helices and ß-pleats, Protein tertiary structures-3-D structure, Protein quaternary structures; **Proteins in action:** Enzymes - The Catalysts: Properties of enzymes, Catalytic power of enzymes, Use of Enzymes in Biotechnology; **Lipids and Biomembranes - The Barriers:** Functions of Biomembranes; **Nucleic Acids - The Managers**

Unit III: GENETICS AND MOLECULAR BIOLOGY

Chapter 1: Concepts of Genetics

Historical Perspective; Mendelian genetics: Mendel's laws of inheritance: Law of segregation, Law of independent assortment, The role of chromosomes in inheritance**; Multiple Alleles; Linkage and Crossing Over:** Genetic recombination; **Genetic Mapping; Gene Interaction; Sex-Linked Inheritance; Extranuclear Inheritance; Quantitative Inheritance; Genes at the Population Level**

Unit III: GENETICS AND MOLECULAR BIOLOGY

Chapter 2: Genes and Genomes: Structure and Function

DNA as genetic material: Identification of DNA as the transforming principle, The Hershey - Chase experiment**; DNA Replication:** Overall principle of DNA replication, Meselson and Stahl experiment, Molecular mechanism of DNA replication, Replicative machinery: enzymes in DNA replication, Semidiscontinuous replication**; Fine Structure of the Gene; From Gene to Protein; Transcription-The Basic Process; Genetic Code; Translation:** Transfer RNA (tRNA): The adaptor molecules, Charging the tRNA: Attachment of amino acid to tRNA, Ribosomes: The cellular protein synthesizing machinery, Mechanism of translation: Initiation, Elongation, Termination; **Regulation of Gene Expression:** Regulation of gene expression in prokaryotes, lac operon, Control of gene expression in eukaryotes; **Mutations:** Genome, chromosome and gene mutations; **DNA Repair; Human Genetic Disorders:** Pedigree Analysis; **Genome Organization:** Viral genomes, Prokaryotic genomes

Unit IV: CELL AND DEVELOPMENT

Chapter 1: The Basic Unit of Life

Cell Structure and Components: Cell membrane: Membrane proteins, Membrane lipids, Cell organelles: Nucleus, Cytoplasm, Endoplasmic reticulum (ER), Ribosomes, Golgi apparatus, Lysosomes, Peroxisomes, Mitochondria, Plastids, Cytoskeleton; **Tissues and Organs:** Animal tissues: Epithelial tissue, Connective tissue, Muscle tissue, Nervous

tissue, Plant Tissues: Simple plant tissues, Complex plant tissues, Organs: Stem Cells; **Biodiversity; Organization of Life**

Unit IV: CELL AND DEVELOPMENT

Chapter 2: Cell Growth and Development

Cell Division: Mitosis: Prophase, Prometaphase, Metaphase, Anaphase, Telophase, Cytokinesis, Meiosis: Meiosis I (Prophase I, Metaphase I, Anaphase I, Telophase I and Cytokinesis), Meiosis II; **Cell Cycle:** Cell cycle regulation; **Cell Communication; Movement:** Amoeboid movement, Movement by cilia and flagella, Muscle and movement; **Nutrition:** Elements of nutrition, Plant nutrition, Animal nutrition, Nutrition in microbes; **Gaseous Exchange:** Gas exchange surfaces, Gas exchange in plants; **Internal transport:** Internal transport in animals, Internal transport in plants; **Maintaining the internal environment:** Regulation of water: Why and How water is regulated, Regulation of temperature: Why and How temperature is regulated; **Reproduction:** Reproduction in microbes, Reproduction in plants: Asexual reproduction, Sexual reproduction, Reproduction in animals: Asexual reproduction, Sexual reproduction, Human reproduction; **In vitro Fertilization; Animal and Plant Development:** Animal development, Plant development; **Immune Response in Humans and Animals:** The immune system, The immune response; **Programmed Cell Death; Defense Mechanisms in Plants:** Passive defense, Active defense

Practicals:

1. Preparation of buffers and pH determination
2. Sterilization techniques
3. Preparation of bacterial growth medium
4. Cell counting
5. Sugar Estimation using Di Nitro Salicylic Acid test (DNS test)
6. Assay for amylase enzyme
7. Protein estimation by biuret method
8. Project work. (Any topic from theory syllabus)

Month wise Syllabus Teaching Plan (2025-26)

Class: XI **Subject: Biotechnology** **Code: 871**

Month	Subject-Content	Teaching Periods	Revision Periods	Practical Work
April	Unit I Chapter 1: Biotechnology: An Overview Unit II Chapter 1: Biomolecules: Building Blocks Practical: Preparation of buffers and pH determination	8 12	2 2	 4
May	Unit II Chapter 2: Macromolecules: Structure and Function Practical: Sterilization Techniques	20	4	 6
June	Summer Vacation (Any Project work should be given related to above chapters)			
July	Unit III Chapter 1: Concepts of Genetics Practical: Preparation of bacterial growth medium Practical: Cell counting	16	2	 4 2

August	Unit III Chapter 2: Genes and Genomes: Structure and Function Practical: Sugar Estimation using Di Nitro Salicylic Acid test (DNS test) Practical: Assay for amylase enzyme	20	4	4 2
September	Revision for Half-Yearly Exam Half-Yearly Exam		16	
October	Unit IV Chapter 1: The Basic Unit of Life Practical: Protein estimation by biuret method	20	4	4
November	Unit IV Chapter 2: Cell Growth and Development (Cell Division, Cell Cycle, Cell Communication, Movement)	16	2	
December	Unit IV Chapter 2: Cell Growth and Development (Nutrition, Gaseous Exchange, Internal Transport, Maintaining the internal Environment,	24	6	

	Reproduction, In vitro Fertilization, Animal and Plant Development, Immune response in Humans and Animals, Programmed Cell Death, Defense Mechanisms in Plants)			
January	Revision		16	
February	Revision		24	
March	Annual Examination			

Note:

• Subject teachers are advised to direct the students to prepare notebook of the Terminology/Definitional Words used in the chapters for enhancement of vocabulary or clarity of the concept.

Prescribed Books:

1. Biotechnology - Text book for Class XI, CBSE Publication

2. Laboratory Manual-Biotechnology-Class XI, CBSE Publication

Question Paper Design (2025-26)

Class: XI **Subject: Biotechnology**

Code: 871 **Time : 02:30 Hrs**

Competencies	Marks	Percentage
Knowledge	24	40%
Understanding	18	30%
Application	12	20%
Skill	6	10%
Total	**60**	**100%**

Type of Question	Marks	Number	Description	Total Marks
Objective Questions	1	15	6 Multiple Choice Questions 3 Fill in the Blanks Questions 3 One-Word Answer Type Questions 3 Assertion-Reason Questions	15
Very Short Answer Type Question	2	6	Internal Choice will be given in any 2 Questions	12
Short Answer Type Question	3	6	Internal Choice will be given in any 2 Questions	18
Essay Answer Type Question	5	3	Internal options will be given in all the questions	15
Total		30		60