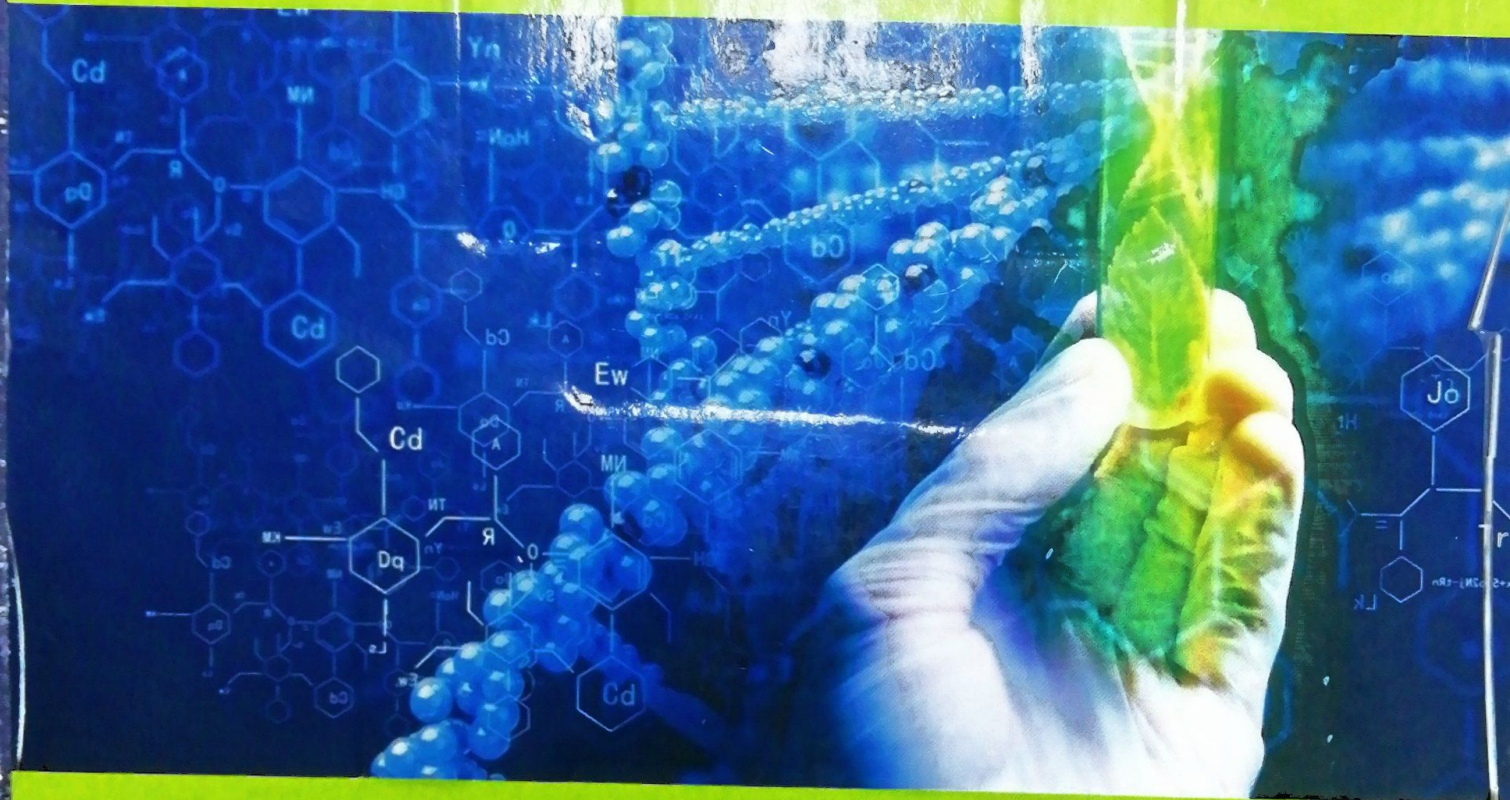


Based on syllabus of recognized universities

Textbook of

# BIOTECHNOLOGY

For B.Sc Biotechnology - First Year



**Including  
practicals  
and  
previous year  
questions**

**Akanksha Jain  
Sonia Bajaj  
Varsha Yadav  
Sonal Khandelwal  
Rachna Tiwari**

TEXTBOOK OF  
**BIOTECHNOLOGY**

**For B.Sc. First Year**

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## Preface

It gives immense pleasure to publish the book on Biotechnology as well as for the students of all the subjects of Life Sciences. The objective of this book is to provide whole syllabus in one book with concise, compact and advanced reading materials in the students of Biotechnology Undergraduates. In order to make this Book very effective or useful because of including of Biotechnology Paper 1 and 2, Biotechnology Practical's and question bank in sufficient numbers.

This book containing all the units of Paper 1 and 2 of Biotechnology including the topic of Biochemistry, Biostatistics, Microbiology, Cell Biology, Genetics, Computers with an introduction to the Scope of Biochemistry, Biotechnology and Microbiology in career. In Last parts of the books containing Biotechnology Instrumentation and related Practical in easiest form.

The Subject Matter of this book is presented in simple understandable language so that the students will be grasp more and more. All the necessary parameters have been taken to make the book self-explanatory with full illustrations. The suitable diagrams, charts, table are given wherever necessary. The book is primarily written and essentially meant for undergraduate students of Biotechnology, but we anticipate that the content may be useful for wide range of students in life Sciences.

I would like to acknowledge the invaluable contributions provided by the Probecell editorial team. I give great thanks to the graphic designers who were instrumental in preparing much of the artwork for this text. I would also like to acknowledge my colleagues and students for their willingness to serve as test subjects for many of the useful contents in this book. Finally, I would like to thank my teachers and parents for their guidance, support, and encouragement throughout the process of completing this book.

We must express thankful to our colleagues and friends who support us and gives their expert advice. The authors will be highly obliged for any type of Suggestions to improve the content are welcome from the teachers and students

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# BIOTECHNOLOGY

## B.Sc. Part I

### Index Paper – 1

## BIOCHEMISTRY, BIostatISTICS AND COMPUTERS

Unit	Topics	Page no.
Unit 1	1. Introduction to Biochemistry: History, Scope and Development 2. Carbohydrates: Classification Structure and Function of Mono, Oligo and Polysaccharides 3. Lipids Structure. Classification and Function	1-40
Unit 2	4. Amino acids and Proteins: Classification Structure and Properties of amino acids, Types of Proteins and their Classification and Function 5. Proteins: 6. Enzymes Nomenclature and Classification of an enzyme, Mechanism of enzyme action. Enzyme Kinetics and Factors affecting the action of the enzyme. Immobilization of enzymes and their application	41-81
Unit 3	7. Hormones: Plant Hormone Auxin and Gibberellins and Animal Hormone-Pancreas 8. Carbohydrates, Proteins and Lipid Metabolism- Glycolysis, Glycogenesis, Gluconeogenesis, Glycogenolysis and Krebs cycle Electron Transport Chain and $\beta$ oxidation of Fatty acids.	82-121
Unit 4	9. Scope of Biostatistics, Samples and Population concept, Collection of data-sampling techniques, Processing and Presentation of data. 10. Measures of Central Tendency: Mean, Median and Mode and Standard Deviation. 11. Probability Calculation: Definition of probability, Theorem on total and compound probability	122-159
Unit 5	12. Computers General introduction, Organization of computer, Digital and Analogue Computers and Computer Algorithm. 13. Concepts of Hardware and Software, Input and Output Devices. 14. Application of computer in the co-ordination of solute concentration, pH and Temperature etc., of a Fermenter in operation and Internet application.	160-177

# BIOTECHNOLOGY

## B.Sc. Part I

### Index Paper – 2

#### CELL BIOLOGY, GENETICS AND MICROBIOLOGY

Unit	Topics	Page no.
Unit 1	<ol style="list-style-type: none"><li>1. Concept of life, Cell as a basic unit of the living system and Cell theory.</li><li>2. Diversity of cell shape and size</li><li>3. Prokaryotic cell structure: Function and ultra-structure of cell (Gram positive and Gram negative Bacteria), Plasma membrane, Flagella, Pills, Endospore and Capsule</li><li>4. Eukaryotic cell Plant cell wall and Plasma member</li></ol>	178-211
Unit 2	<ol style="list-style-type: none"><li>5. Cytoplasm: Structure and Functions of Endoplasmic reticulum, Ribosome, Golgi complex, Lysosomes, Nucleus, Mitochondria and Chloroplast.</li><li>6. Cytoskeleton: Microtubules, Microfilaments and Intermediate filaments.</li><li>7. Cell division: Mitosis and Meiosis.</li><li>8. Programmed Cell Death.</li></ol>	212-275
Unit 3	<ol style="list-style-type: none"><li>9. Mendel's Laws of Inheritance.</li><li>10. Linkage and Crossing over.</li><li>11. Chromosome variation in number and structure: Deletion, Duplication, Translocation, Inversion and Aneuploidy, Euploidy (Monoploidy and Polyploidy and its importance).</li></ol>	276-304
Unit 4	<ol style="list-style-type: none"><li>12. History, Scope and Development of Microbiology.</li><li>13. Basic techniques of Microbial Culture</li><li>14. Microbial Growth &amp; Nutrition of Bacteria: Isolation, media sterilization- physical and chemical agents, pure culture-pour plate method, streak plate method and spread plate method.</li><li>15. General features and Economic importance of Fungi, Algae and Protozoa etc.</li></ol>	305-362
Unit 5	<ol style="list-style-type: none"><li>16. Bacterial Reproduction: Conjugation, Transduction and Transformation.</li><li>17. Mycoplasma - History, Classification, Structure reproduction &amp; Diseases.</li><li>18. Viruses - Basic features, Structure, Classification, Multiplication, Bacteriophages (Morphology, life cycle, infection and medicinal importance)</li></ol>	363-396

## Practical's

S.No	Title
1	An introduction to Biotechnology, General rules for writing good lab notebooks aseptic technique and safety
2	Basic Requirements in a Laboratory:
3	Instruments used in Biotechnology laboratories
4	To perform different method of sterilization of glassware used in lab.
5	Preparation of basic liquid media (broth) for the routine cultivation of bacteria.
6	Preparation of basic solid media, agar slants and agar deep tubes for the routine cultivation of microorganisms.
7	Demonstration of selective and differential media.
8	Isolation and enumeration of micro-organisms from soil by the serial-dilution agar plating.
9	Isolation of microorganisms from air.
10	Preparation of bacterial smear.
11	Calibration of an ocular micrometer for different objective (low- power, high power and oil- immersion) of a microscope.
12	Measurement of micro- organisms by the use of ocular micrometer.
13	Enumeration (counting) of bacteria by plate count or serial dilution agar plate technique.
14	Pour- plate method.
15	Streak- plate method.
16	Spread – plate technique.
17	Broth culture cultivation.
18	Determination of bacterial growth curve by turbidity measurements (spectrophotometer method).
19	To study and demonstrate mitosis by preparing the mount of an onion root tip cells
20	To perform the Gram staining of given bacterial sample.
21	To determine the ability of an organism to hydrolyze starch or to produce alpha amylase.
22	Ninhydrin test is a chemical test performed to detect the presence of protein, ammonia, primary/secondary amines, or amino acids.
23	Xanthoproteic test for aromatic amino acid estimation.
24	Biuret test for protein estimation.
25	Millions test for phenolic group of protein

26	Molisch's test for carbohydrates.
27	To determine the presence or absence of reducing sugar in the solution by benedict test
28	Problems on mean, mode and median.