

Preface

OVERVIEW

There has been a significant change in the methods of study of life sciences during the last thirty years. The focus of attention has shifted from morphological description of living organisms to their physiological functions and further on to their chemical organisation. The study of biotechnology is the next logical step in this order after biophysiology and biochemistry, the principles of which are applied to understand and formulate many biotechnological applications.

Traditional biotechnological methods, though old, have provided the basis for modern biotechnology. We knew the production of alcoholic beverages and many household items (curd, cheese, bread, etc.) from the foundations laid down by traditional biotechnology.

Modern biotechnology is an exciting evolutionary scientific discipline that is likely to contribute unprecedented benefits to humanity. Scientists have already produced vitamin-enriched rice, anti-cancer tomatoes, transgenic animals used for therapeutics (blood-clot buster, insulin, haemoglobin) and transgenic bacteria to degrade hazardous compounds. Attempts are on to generate human organs and tissues from 'stem cells'.

RATIONALE FOR WRITING THIS BOOK

Realising the importance of the subject, the University Grants Commission (UGC) recommended a model biotechnology curriculum for BSc and MSc degrees of Indian universities. Altogether twelve subjects were included. Later, the Department of Biotechnology (DBT) proposed a curriculum containing thirteen subjects. The subjects proposed by UGC and DBT were largely identical with just a few additions and deletions.

We have tried implementing our rich and extensive experience in teaching biotechnology and its related fields in this book, keeping in view the curricula suggested by UGC and DBT.

TARGET AUDIENCE

The book will primarily be useful for undergraduate life science students. However, postgraduate students would also benefit from its contents.

Students opting for biotechnology as an elective paper at the 10+2 level (CBSE) can also use this book as a reference.

ABOUT THE BOOK

The contents of the present book aim to provide fundamental knowledge on the subject. While doing so, we have taken into consideration the syllabi of different universities. This book is a perfect amalgamation of fundamentals, historical aspects and modern findings.

We have designed the book to make it user-friendly, with well-connected chapters in each section. Wherever necessary, suitable illustrations and tables provide a clear comprehension of the contents. As far as possible, we have kept the language simple so that students can understand the complex topics. The last chapter includes some common practical experiments usually undertaken in a biotechnology course. The practical training would help those aspiring to join research for higher studies.

SALIENT FEATURES

- *Covers all the important subject-areas*—Microbiology, Biochemistry, Genomics, Proteomics, Molecular Biology, Recombinant DNA Technology (RDT), etc.
- *Industrial and application orientation*
 - a. Industrial Linkages—through Case Studies
 - b. Biotech Laboratory Techniques—PCR, Electrophoresis, Chromatography, RDT and Genetic Engineering
- *Rich pedagogy*
 - a. More than 600 illustrations add to visual account
 - b. Graded chapter-end questions patterned as per major university examinations
 - c. Important terms provided in the Glossary

CHAPTER ORGANISATION

Chapters on Biomolecular, Biophysical Chemistry, Metabolic Pathways and Regulation, and Basic Enzymology provide the central information related to Biochemistry. The chapter on Cell Biology gives an overall view about cell inclusions and their importance. Nucleic acid genes and related topics have been discussed in several chapters (DNA Replication, Repair and Recombination, Transcription and Translation, RNA Processing, Gene Regulation, Molecular Tools and Genetic Engineering, Gene Product Engineering, Transgenic Technology, Genomics and Proteomics, Molecular Markers and Gene Mapping, Biotechnological Application in Plants and Animals have been discussed in chapters on Plant Biotechnology and Animal Biotechnology).

Chapters on Basic Immunology and Immunotechnology discuss the aspects of immunology and health science related to biotechnology. Chapters on Industrial Biotechnology describe the use of biotechnological techniques for product formation in industries. Similarly, we have discussed environmental issues in a chapter on Environmental Biotechnology.

Realising the importance of microorganisms in biotechnological studies, we have devoted one chapter to Microbial Physiology Pathogenesis and Genetics. Chapters on specialised topics (Bio-informatics, Bioprocess Engineering, Bio-energy Technology) depict the application of biotechnology in these areas. A separate chapter on Bio-ethics discusses bio-ethical issues concerning social and legal problems.

In order to make students aware of principles and applications of biotechnology, we have included several experiments in a chapter on Experiments in Biotechnology.

Each chapter begins with what the students are going to learn. The chapters begin with either a historical background or recent development on the subject. A summary of the contents at the end of each chapter provides recapitulation of what they have read.

Important terms have been highlighted in the glossary along with the index at the end of the book.

Simple and lucid language has been used to describe the topics.

With our rich experience in teaching Biotechnology and Allied subjects of BSc and MSc courses, we have given special attention to the requirements of students by incorporating *questions* (long and short-answer-type) generally asked in examinations.

ONLINE LEARNING CENTER

Interesting web supplements are available at <http://www.mhhe.com/patnaik/tbb1>

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FEEDBACK

All of us would appreciate criticisms and suggestions from students and teachers to help us improve the quality of presentation in future.

B K PATNAIK, T C KARA, S N GHOSH, A K DALAI
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Publisher's Note

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