

Concepts in Biotechnology

An affordable Overview of
Biotechnology Through Self Study
and by Open Learning

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Concepts in Biotechnology

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‘Dexterity in action is the best evidence of
application of technology’

Bhagavadgeeta [Chapter II, Stanza 50]

Biotechnology is an exciting area of human endeavour that encompasses a range of sciences and technologies. They include chemistry, biochemistry, biophysics, molecular biology, genetics, microbiology, plant and animal cell culture, fermentations, chemical engineering, biochemical engineering and process engineering. The multidisciplinary nature of biotechnology is thus self-evident. Like the proverbial elephant as recognised by the four blind men, biotechnology means many different things to different people. Although variously defined, it is a new biological approach to a wide range of industrial processes. Any comprehensive attempt to

present this subject therefore can at best be an overview with emphasis on concepts. This book aims to do just that.

Biotechnology as an activity has existed since ancient times. Then what is new? The present excitement in biotechnology is because we have begun to understand and manipulate biological systems at the molecular level. As Arthur Kornberg put it

“DNA and RNA provide the script, but the enzymes do the acting”. Our ability to achieve controlled modifications of DNA is known as recombinant DNA technology. These selective changes to DNA allow us to impart new/modified messages in a variety of species. With this powerful tool at the molecular level, we are able to express a desired property in a macromolecule, a bacterium, a cultured cell or an entire organism.

A book on biotechnology by single author brings in the associated special flavour and prejudice. The book under review is unique in that it has chapterwise contributions by experts in each discipline. A degree of repetition of material in some of the chapters (as in chapters 5 and 11) is an unavoidable flip side. As projected in chapter 1, the book assumes exposure to high school level chemistry and physics; a built-in emphasis to target biology background audience is apparent. Such an approach harbours the dangers of being more descriptive and less quantitative (e.g., chapters 7 and 8).

It is commendable that such a vast subject is well covered in this book. The value of its presentation is complemented through pertinent references at the end of each chapter and a short glossary at the end. The concepts have been beautifully reinforced with self-assessment exercises and assignments.

biotechnology.

Approaches to exploit animals and animal cells in furthering human health and related industry are the subject of chapters 9, 10, 11 and 13. The concepts on immune system, hybridoma technology, DNA/immuno-diagnostics, *in vitro* fertilisation and embryo transfer are lucidly described with examples. No doubt, with the recent advent of “Dolly — the cloned sheep”, aspects of totipotency in chapter 13 will soon have to be redefined.

The first four chapters introduce the basics and hence make essential reading, especially in brushing up cell biology fundamentals. Chapters 4 and 5 provide the essence of recombinant DNA methodology. With the explosion of information — in genomic DNA sequences and protein data bases — computational biology has kept pace; Chapters 6 and 14 cover the rapid strides made in bioinformatics and structure prediction leading to rational design of these molecules.

The social, ethical and environmental impact of biotechnology and the issues concerned are summarised in the last three chapters.

Any treatment of biotechnology without a coverage on enzymes is incomplete. The topic on immobilized enzymes and their use in bioreactors and biosensors is uniquely brought out in chapter 7. Readers with prior background in enzyme catalysis and kinetics would savor this chapter. Chapter 8 is a nice coverage of biochemical engineering principles and microbial fermentations. Chapter 12 provides a meticulous and up-to-date overview of the oldest of all biotechnologies — the plant

It is commendable that such a vast subject is well covered in this book. The value of its presentation is complemented through pertinent references at the end of each chapter and a short glossary at the end. The concepts have been beautifully reinforced with self-assessment exercises and assignments. But for a few errors in structures (such as p.108), the book is easily readable and covers all aspects of biotechnology known to us today. It is a worthy effort in introducing this subject to the undergraduate as well as M.Sc levels, and is available at an affordable price.

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