

Contents

Preface

vii

1. The Molecules

1

Ionic Bonding • Describe the Characteristics of Organic Compounds • Specify the Importance of Nucleic Acids • Define Enzymes and Explain the Make-up and Importance of Enzymes • Molecules of Life: Biomolecules • Types of Biomolecules • Identification of Genetic Material • Direct Evidences for DNA as the Genetic Material • Mode of Infection of Bacteriophages and Identification of DNA as their Genetic Material • Indirect Evidences for DNA as the Genetic Material • Evidences for RNA as the Genetic Material of Some Viruses • Deoxyribonucleic Acid (DNA) • Base Pair • Nucleic Acid Analogues • Backbone Analogues • Base Analogues • Base Analogs and Intercalators • Genes and Genomes • DNA-modifying Enzymes • Genetic Recombination • Uses in Technology

2. Genetic Code

53

Discovery • Transfer of Information Via the Genetic Code • Salient Features • Expanded Genetic Code • Diversity • Gene: Its Expression • Mechanism • Measurement • Expression System • Transcriptional Bursting • Expression Profiling • Validation of High Throughput Measurements • Genetic and Genomic Nomenclature • Paramutation • Characteristics and Function • AlloMap Molecular Expression Testing

3. Genetic Engineering

102

Genome Analysis? • Open Reading Frame • What is Coding Sequence • DNA Replication • Replication Occurs Differently on Antiparallel Strands of DNA • DNA Damage, Repair, and Recombination • DNA Damage • Nuclear versus Mitochondrial DNA Damage • Global Response to DNA Damage • DNA Repair and Aging • Medicine and DNA Repair Modulation • DNA Repair and Evolution • Senescence • Transcription • Major Steps • Transcription Factories • Ribonucleic Acid • Comparison with DNA • Types of RNA • Key Discoveries in RNA Biology • Transcription and Processing of RNA • Types of RNA

• Messenger RNA • Ribozyme • Nuclear Polyadenylation • Cytoplasmic Polyadenylation • Messenger RNA Decapping • Open Reading Frame • The RNA-induced Silencing Complex	
4. Recombinant DNA Technology	190
Gene Targeting • Opposition and Criticism • Human Genetic Engineering • Negative Genetic Engineering (Cures and Treatments) • GM Food Controversy • Health Risks and Benefits • Controversial Cases • Genetically Modified Organism • Governmental Support and Opposition • Marker Assisted Selection a Way to Select Suitable Offspring without Using Genetic Engineering • Situations that are Favorable for Molecular Marker Selection • Paratransgenesis	
5. Techniques in Molecular Biology	244
Expression Cloning • Role of Cellular Biology • Polymerase Chain Reaction • Protein Folding and Modifications • The Information for Protein Folding is Encoded in the Sequence • Protein Synthesis • Folding of Proteins in Vivo is Promoted by Chaperones • Chemical Modifications and Processing Alter the Biological Activity of Proteins • Cells Degrade Proteins Via Several Pathways • Aberrantly Folded Proteins are Implicated in Slowly Developing Diseases • Genomics and Proteomics • Proteomics	
<i>Bibliography</i>	267
<i>Index</i>	271