

---

# CONTENTS

---

CHAPTER 1. Molecules and Life 1

Part I CONFORMATION: exemplified by the relationship between the three-dimensional structure of proteins and their biological activity 9

- CHAPTER 2. Introduction to Protein Structure and Function 11
- 3. Oxygen Transporters: Myoglobin and Hemoglobin 46
  - 4. Hemoglobin: An Allosteric Protein 71
  - 5. Molecular Disease: Sickle-Cell Anemia 95
  - 6. Introduction to Enzymes 115
  - 7. Mechanisms of Enzyme Action: Lysozyme and Carboxypeptidase 153
  - 8. Zymogen Activation: Digestive Enzymes and Clotting Factors 178
  - 9. Connective-Tissue Proteins: Collagen and Elastin 206
  - ✓10. Introduction to Biological Membranes 227

Part II GENERATION AND STORAGE OF METABOLIC ENERGY 255

- CHAPTER 11. Metabolism: Basic Concepts and Design 257
- 12. Glycolysis 277
  - 13. Citric Acid Cycle 307
  - 14. Oxidative Phosphorylation 331
  - 15. Pentose Phosphate Pathway and Gluconeogenesis 356
  - 16. Glycogen and Disaccharide Metabolism 378
  - 17. Fatty Acid Metabolism 404
  - 18. Amino Acid Degradation and the Urea Cycle 432
  - 19. Photosynthesis 456

**Part III BIOSYNTHESIS OF MACROMOLECULAR PRECURSORS 477**

- CHAPTER 20. Biosynthesis of Membrane Lipids and Steroid Hormones 479**  
21. Biosynthesis of Amino Acids and Heme 503  
22. Biosynthesis of Nucleotides 528

**Part IV INFORMATION: storage, transmission, and expression of genetic information 555**

- CHAPTER 23. DNA: Genetic Role, Structure, and Replication 557**  
24. Messenger RNA and Transcription 594  
25. The Genetic Code and Gene-Protein Relationships 623  
26. Protein Synthesis 645  
27. Control of Gene Expression 679  
28. Eucaryotic Chromosomes 693  
29. Viruses 708

**Part V MOLECULAR PHYSIOLOGY: interaction of information, conformation, and metabolism in physiological processes 729**

- CHAPTER 30. Immunoglobulins 731**  
31. Bacterial Cell Walls 754  
32. Membrane Transport 767  
33. Excitable Membranes 787  
34. Hormone Action 807  
35. Muscle Contraction and Cell Motility 826

Appendixes 843

Answers to Problems 847

Index 855