

Brief Contents

PART I The Realm of Biochemistry 1

- 1 The Scope of Biochemistry 3
- 2 The Matrix of Life: Weak Interactions in an Aqueous Environment 30
- 3 The Energetics of Life 59

PART II Molecular Architecture of Living Matter 89

- 4 Nucleic Acids 91
- 5 Introduction to Proteins: The Primary Level of Protein Structure 133
- 6 The Three-Dimensional Structure of Proteins 171
- 7 Protein Function and Evolution 216
- 8 Carbohydrates 260
- 9 Lipids, Membranes, and Cellular Transport 298

PART III Dynamics of Life: Catalysis and Control of Biochemical Reactions 337

- 10 Enzymes: Biological Catalysts 339
- 11 The Regulation of Enzyme Activity 381
- 12 Introduction to Metabolism 404

PART IV Dynamics of Life: Energy, Biosynthesis, and Utilization of Precursors 431

- 13 Carbohydrate Metabolism I: Anaerobic Processes in Generating Metabolic Energy 433

3 The Energetics of Life 59

Energy, Heat, and Work 59

Internal Energy and the State of a System 59

The First Law of Thermodynamics 60

Enthalpy 61

Reversible and Irreversible Processes 63

The Direction of Processes: Entropy, Free

Energy, and the Second Law 65

Spontaneity and Entropy 66

Free Energy 68

The Interplay of Enthalpy and Entropy: An

Example 68

14 Oxidative Processes: Citric Acid Cycle and Pentose Phosphate Pathway 467

15 Biological Oxidations, Electron Transport, and Oxidative Phosphorylation 504

16 Carbohydrate Metabolism II: Biosynthesis 538

17 Lipid Metabolism I: Fatty Acids and Triacylglycerols 571

18 Lipid Metabolism II: Phospholipids, Steroids, Isoprenoids, and Eicosanoids 604

19 Photosynthesis 643

20 Metabolism of Nitrogenous Compounds: Principles of Biosynthesis, Utilization, Turnover, and Excretion 670

21 Metabolism of Nitrogenous Compounds: Amino Acids 704

22 Nucleotide Metabolism 742

23 Integration and Control of Metabolic Processes 779

PART V Information 815

24 Information Copying: Replication 817

25 Information Restructuring: Restriction, Repair, Recombination, Rearrangement, Amplification 860

26 Information Transfer: Transcription 910

27 Information Decoding: Translation 954

28 Encoding and Expression of Genetic Information in Eukaryotes 996

29 Information Processing and Expression in Multicellular Organisms 1035

Answers to Problems 1075

Index 1097