

Brief Contents

- 1 Evolution, the Themes of Biology, and Scientific Inquiry 1

1 THE CHEMISTRY OF LIFE 27

- 2 The Chemical Context of Life 28
3 Water and Life 44
4 Carbon and the Molecular Diversity of Life 56
5 The Structure and Function of Large Biological Molecules 66

2 THE CELL 92

- 6 A Tour of the Cell 93
7 Membrane Structure and Function 124
8 An Introduction to Metabolism 141
9 Cellular Respiration and Fermentation 162
10 Photosynthesis 185
11 Cell Communication 210
12 The Cell Cycle 232

3 GENETICS 251

- 13 Meiosis and Sexual Life Cycles 252
14 Mendel and the Gene Idea 267
15 The Chromosomal Basis of Inheritance 292
16 The Molecular Basis of Inheritance 312
17 Gene Expression: From Gene to Protein 333
18 Regulation of Gene Expression 360
19 Viruses 392
20 DNA Tools and Biotechnology 408
21 Genomes and Their Evolution 436

4 MECHANISMS OF EVOLUTION 461

- 22 Descent with Modification: A Darwinian View of Life 462
23 The Evolution of Populations 480
24 The Origin of Species 500
25 The History of Life on Earth 519

5 THE EVOLUTIONARY HISTORY OF BIOLOGICAL DIVERSITY 546

- 26 Phylogeny and the Tree of Life 547
27 Bacteria and Archaea 567
28 Protists 587
29 Plant Diversity I: How Plants Colonized Land 612

- 30 Plant Diversity II: The Evolution of Seed Plants 630

- 31 Fungi 648
32 An Overview of Animal Diversity 667
33 An Introduction to Invertebrates 680
34 The Origin and Evolution of Vertebrates 712

6 PLANT FORM AND FUNCTION 751

- 35 Plant Structure, Growth, and Development 752
36 Resource Acquisition and Transport in Vascular Plants 778
37 Soil and Plant Nutrition 799
38 Angiosperm Reproduction and Biotechnology 815
39 Plant Responses to Internal and External Signals 836

7 ANIMAL FORM AND FUNCTION 866

- 40 Basic Principles of Animal Form and Function 867
41 Animal Nutrition 892
42 Circulation and Gas Exchange 915
43 The Immune System 946
44 Osmoregulation and Excretion 971
45 Hormones and the Endocrine System 993
46 Animal Reproduction 1013
47 Animal Development 1037
48 Neurons, Synapses, and Signaling 1061
49 Nervous Systems 1079
50 Sensory and Motor Mechanisms 1101
51 Animal Behavior 1133

8 ECOLOGY 1157

- 52 An Introduction to Ecology and the Biosphere 1158
53 Population Ecology 1184
54 Community Ecology 1208
55 Ecosystems and Restoration Ecology 1232
56 Conservation Biology and Global Change 1254