

Brief Contents

1 Biology and the Tree of Life 1

UNIT 1 THE MOLECULAR ORIGIN AND EVOLUTION OF LIFE 18

- 2 Water and Carbon: The Chemical Basis of Life 18
- 3 Protein Structure and Function 41
- 4 Nucleic Acids and the RNA World 57
- 5 An Introduction to Carbohydrates 72
- 6 Lipids, Membranes, and the First Cells 84

UNIT 2 CELL STRUCTURE AND FUNCTION 106

- 7 Inside the Cell 106
- 8 Energy and Enzymes: An Introduction to Metabolic Pathways 136
- 9 Cellular Respiration and Fermentation 154
- 10 Photosynthesis 176
- 11 Cell-Cell Interactions 200
- 12 The Cell Cycle 219

UNIT 3 GENE STRUCTURE AND EXPRESSION 237

- 13 Meiosis 237
- 14 Mendel and the Gene 256
- 15 DNA and the Gene: Synthesis and Repair 284
- 16 How Genes Work 304
- 17 Transcription, RNA Processing, and Translation 317
- 18 Control of Gene Expression in Bacteria 336
- 19 Control of Gene Expression in Eukaryotes 348
- 20 Analyzing and Engineering Genes 368
- 21 Genomics and Beyond 389

UNIT 4 DEVELOPMENTAL BIOLOGY 405

- 22 Principles of Development 405
- 23 An Introduction to Animal Development 419
- 24 An Introduction to Plant Development 432

UNIT 5 EVOLUTIONARY PROCESSES AND PATTERNS 444

- 25 Evolution by Natural Selection 444
- 26 Evolutionary Processes 465
- 27 Speciation 489
- 28 Phylogenies and the History of Life 505

UNIT 6 THE DIVERSIFICATION OF LIFE 528

- 29 Bacteria and Archaea 528
- 30 Protists 552
- 31 Green Algae and Land Plants 577
- 32 Fungi 612
- 33 An Introduction to Animals 636
- 34 Protostome Animals 657
- 35 Deuterostome Animals 681
- 36 Viruses 711

UNIT 7 HOW PLANTS WORK 731

- 37 Plant Form and Function 731
- 38 Water and Sugar Transport in Plants 754
- 39 Plant Nutrition 775
- 40 Plant Sensory Systems, Signals, and Responses 793
- 41 Plant Reproduction 822

UNIT 8 HOW ANIMALS WORK 842

- 42 Animal Form and Function 842
- 43 Water and Electrolyte Balance in Animals 861
- 44 Animal Nutrition 882
- 45 Gas Exchange and Circulation 902
- 46 Animal Nervous Systems 928
- 47 Animal Sensory Systems 952
- 48 Animal Movement 972
- 49 Chemical Signals in Animals 991
- 50 Animal Reproduction 1013
- 51 The Immune System in Animals 1037

UNIT 9 ECOLOGY 1059

- 52 An Introduction to Ecology 1059
- 53 Behavioral Ecology 1082
- 54 Population Ecology 1101
- 55 Community Ecology 1123
- 56 Ecosystems and Global Ecology 1148
- 57 Biodiversity and Conservation Biology 1172