

Contents

UNIT

1

The Nature of Life

xxii-59

Chapter 1	The Science of Biology	.2
1-1	What Is Science?	.3
1-2	How Scientists Work	.8
	▶ <i>Biology and History: Major Discoveries</i>	.12
1-3	Studying Life	.16
	▶ <i>Issues in Biology: When Scientists Have a Conflict of Interest</i>	.23
1-4	Tools and Procedures	.24
Chapter 2	The Chemistry of Life	.34
2-1	The Nature of Matter	.35
	▶ <i>Careers in Biology: Forensic Scientist</i>	.37
2-2	Properties of Water	.40
2-3	Carbon Compounds	.44
2-4	Chemical Reactions and Enzymes	.49

UNIT

2

Ecology

60-165

Chapter 3	The Biosphere	.62
3-1	What Is Ecology?	.63
	▶ <i>Technology & Society: Exploring Ecology From Space</i>	.66
3-2	Energy Flow	.67
3-3	Cycles of Matter	.74
Chapter 4	Ecosystems and Communities	.86
4-1	The Role of Climate	.87
4-2	What Shapes an Ecosystem?	.90
	▶ <i>Careers in Biology: Forestry Technician</i>	.95
4-3	Land Biomes	.98
4-4	Aquatic Ecosystems	.106



Chapter 5	Populations	118
	5-1 How Populations Grow	119
	5-2 Limits to Growth	124
	► <i>Issues in Biology: Does the Gray Wolf Population Need Protection?</i>	128
	5-3 Human Population Growth	129
Chapter 6	Humans in the Biosphere	138
	6-1 A Changing Landscape	139
	6-2 Renewable and Nonrenewable Resources	144
	6-3 Biodiversity	150
	► <i>Biology and History: Success in Conservation</i>	154
	6-4 Charting a Course for the Future	157

UNIT

3

Cells

166-259

Chapter 7	Cell Structure and Function	168
	7-1 Life Is Cellular	169
	► <i>Biology and History: A History of the Cell</i>	170
	7-2 Cell Structures	173
	7-3 Movement Through the Membrane	184
	7-4 The Diversity of Cellular Life	190
	► <i>Careers in Biology: Histotechnologist</i>	192
Chapter 8	Photosynthesis	200
	8-1 Energy and Life	201
	8-2 Photosynthesis: An Overview	204
	► <i>Biology and History: Understanding Photosynthesis</i>	204
	8-3 The Reactions of Photosynthesis	208
Chapter 9	Cellular Respiration	220
	9-1 Chemical Pathways	221
	9-2 The Krebs Cycle and Electron Transport	226
	► <i>Issues in Biology: Should Creatine Supplements Be Banned?</i>	233
Chapter 10	Cell Growth and Division	240
	10-1 Cell Growth	241
	10-2 Cell Division	244
	10-3 Regulating the Cell Cycle	250
	► <i>Technology & Society: Stem Cells: Promises and Problems</i>	253



Chapter 11	Introduction to Genetics	262
11-1	The Work of Gregor Mendel	263
11-2	Probability and Punnett Squares	267
11-3	Exploring Mendelian Genetics	270
11-4	Meiosis	275
11-5	Linkage and Gene Maps	279
Chapter 12	DNA and RNA	286
12-1	DNA	287
	► <i>Biology and History: Discovering the Role of DNA</i>	292
12-2	Chromosomes and DNA Replication	295
12-3	RNA and Protein Synthesis	300
12-4	Mutations	307
12-5	Gene Regulation	309
Chapter 13	Genetic Engineering	318
13-1	Changing the Living World	319
13-2	Manipulating DNA	322
13-3	Cell Transformation	327
	► <i>Issues in Biology: Do Genetically Modified Foods Need Stricter Controls?</i>	330
13-4	Applications of Genetic Engineering	331
Chapter 14	The Human Genome	340
14-1	Human Heredity	341
14-2	Human Chromosomes	349
	► <i>Issues in Biology: Who Controls Your DNA?</i>	354
14-3	Human Molecular Genetics	355
	► <i>Careers in Biology: Geneticist</i>	359

Chapter 15	Darwin's Theory of Evolution	368
15-1	The Puzzle of Life's Diversity	369
15-2	Ideas That Shaped Darwin's Thinking	373
	► <i>Biology and History: A History of Evolutionary Thought</i>	374
15-3	Darwin Presents His Case	378
Chapter 16	Evolution of Populations	392
16-1	Genes and Variation	393
16-2	Evolution as Genetic Change	397
	► <i>Issues in Biology: Should the Use of Antibiotics Be Restricted?</i>	403
16-3	The Process of Speciation	404

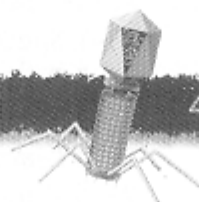
Chapter 17	The History of Life	416
17-1	The Fossil Record	417
17-2	Earth's Early History	423
17-3	Evolution of Multicellular Life	429
	► <i>Careers in Biology: Fossil Preparator</i>	433
17-4	Patterns of Evolution	435
Chapter 18	Classification	446
18-1	Finding Order in Diversity	447
18-2	Modern Evolutionary Classification	451
	► <i>Technology & Society: The Search for New Species</i>	456
18-3	Kingdoms and Domains	457

UNIT

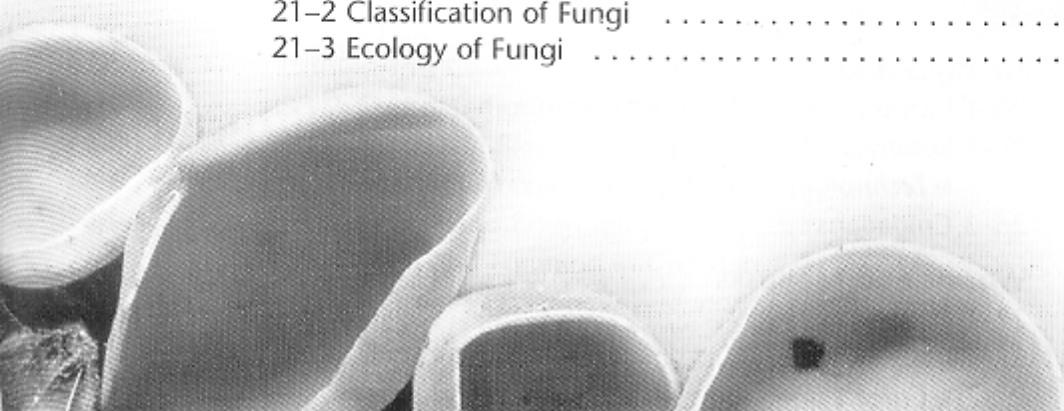
6

Microorganisms and Fungi

468-547

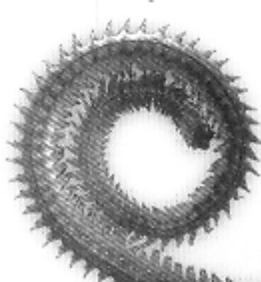


Chapter 19	Bacteria and Viruses	470
19-1	Prokaryotes	471
	► <i>Careers in Biology: Epidemiologist</i>	475
19-2	Bacteria in Nature	477
	► <i>Biology and History: Eliminating Disease</i>	478
19-3	Viruses	482
Chapter 20	Protists	494
20-1	The Kingdom Protista	495
20-2	Animallike Protists: Protozoans	497
	► <i>Issues in Biology: How Should Water Be Protected</i>	
	Against Cryptosporidium?	504
20-3	Plantlike Protists: Unicellular Algae	505
20-4	Plantlike Protists: Red, Brown, and Green Algae	510
20-5	Funguslike Protists	516
Chapter 21	Fungi	526
21-1	The Kingdom Fungi	527
21-2	Classification of Fungi	530
21-3	Ecology of Fungi	537



Chapter 22	Plant Diversity	550
22-1	Introduction to Plants	551
22-2	Bryophytes	556
22-3	Seedless Vascular Plants	560
22-4	Seed Plants	564
22-5	Angiosperms—Flowering Plants	569
	► <i>Careers in Biology: Botanical Illustrator</i>	571
Chapter 23	Roots, Stems, and Leaves	578
23-1	Specialized Tissues in Plants	579
23-2	Roots	584
23-3	Stems	589
23-4	Leaves	595
23-5	Transport in Plants	599
Chapter 24	Reproduction of Seed Plants	608
24-1	Reproduction With Cones and Flowers	609
	► <i>Technology & Society: Flowers by Design</i>	617
24-2	Seed Development and Germination	618
24-3	Plant Propagation and Agriculture	622
	► <i>Biology and History: The Evolution of Agriculture</i>	624
Chapter 25	Plant Responses and Adaptations	632
25-1	Hormones and Plant Growth	633
25-2	Plant Responses	639
25-3	Plant Adaptations	643
	► <i>Issues in Biology: Are Herbal Drugs Safe?</i>	647

Chapter 26	Sponges and Cnidarians	656
26-1	Introduction to the Animal Kingdom	657
26-2	Sponges	664
	► <i>Technology & Society: Sunscreen From the Sea</i>	668
26-3	Cnidarians	669
Chapter 27	Worms and Mollusks	682
27-1	Flatworms	683
27-2	Roundworms	689
	► <i>Careers in Biology: Meat Inspector</i>	691
27-3	Annelids	694
	► <i>Issues in Biology: What Can Be Done About the Zebra Mussel?</i>	700
27-4	Mollusks	701



Chapter 28	Arthropods and Echinoderms	714
28-1	Introduction to the Arthropods	715
28-2	Groups of Arthropods	720
28-3	Insects	726
	► <i>Biology and History: Insect-Borne Diseases</i>	730
28-4	Echinoderms	734
Chapter 29	Comparing Invertebrates	744
29-1	Invertebrate Evolution	745
29-2	Form and Function in Invertebrates	751

UNIT

9

Chordates

764-887

Chapter 30	Nonvertebrate Chordates, Fishes, and Amphibians	766
30-1	The Chordates	767
30-2	Fishes	771
30-3	Amphibians	782
Chapter 31	Reptiles and Birds	796
31-1	Reptiles	797
31-2	Birds	806
Chapter 32	Mammals	820
32-1	Introduction to the Mammals	821
32-2	Diversity of Mammals	828
32-3	Primates and Human Origins	833
	► <i>Biology and History: Human-Fossil Seekers</i>	836
Chapter 33	Comparing Chordates	848
33-1	Chordate Evolution	849
	► <i>Issues in Biology: Should Marine Mammals Be Kept in Captivity?</i>	853
33-2	Controlling Body Temperature	854
33-3	Form and Function in Chordates	857
	► <i>Careers in Biology: Veterinary Technician</i>	863
Chapter 34	Animal Behavior	870
34-1	Elements of Behavior	871
	► <i>Technology & Society: Using Remote Sensing to Study Animal Behavior</i>	877
34-2	Patterns of Behavior	878



**UNIT****10****The Human Body****888-1053**

Chapter 35	Nervous System	890
	35-1 Human Body Systems	891
	35-2 The Nervous System	897
	35-3 Divisions of the Nervous System	901
	35-4 The Senses	906
	35-5 Drugs and the Nervous System	910
Chapter 36	Skeletal, Muscular, and Integumentary Systems	920
	36-1 The Skeletal System	921
	36-2 The Muscular System	926
	▶ <i>Technology & Society: Manufacturing Artificial Skin</i>	932
	36-3 The Integumentary System	933
Chapter 37	Circulatory and Respiratory Systems	942
	37-1 The Circulatory System	943
	▶ <i>Biology and History: Cardiovascular Advances</i>	948
	37-2 Blood and the Lymphatic System	951
	37-3 The Respiratory System	956
	▶ <i>Careers in Biology: Respiratory Care Practitioner</i>	959
Chapter 38	Digestive and Excretory Systems	970
	38-1 Food and Nutrition	971
	38-2 The Process of Digestion	978
	38-3 The Excretory System	985
Chapter 39	Endocrine and Reproductive Systems	996
	39-1 The Endocrine System	997
	39-2 Human Endocrine Glands	1003
	39-3 The Reproductive System	1009
	39-4 Fertilization and Development	1016
Chapter 40	The Immune System and Disease	1028
	40-1 Infectious Disease	1029
	40-2 The Immune System	1034
	40-3 Immune System Disorders	1041
	▶ <i>Issues in Biology: Slowing the AIDS Epidemic</i>	1045
	40-4 Cancer	1046
Appendices	Appendix A: Science Skills	1054
	Appendix B: Science Safety	1060
	Appendix C: The Metric System	1063
	Appendix D: Use of the Microscope	1064
	Appendix E: Classification	1066
Glossary		1072
Index		1092
Credits		1110