

BIOLOGY (3RD EDITION)

TABLE OF CONTENTS

CHAPTER ONE — LABORATORY METHODS & SKILLS

TOPIC A: Analyzing and Building on Past Scientific Contributions [Embedded Skills]	
PART 1: Asking Questions About the Natural World.....	1
PART 2: Developing New Research Ideas From Prior Studies.....	3
PART 3: Reporting Experimental Results to the Scientific Community.....	5
PART 4: Repeated Scrutiny of Scientific Questions.....	6
TOPIC B: Scientific Method	
PART 1: Question Development and Research.....	7
PART 2: Hypotheses.....	9
PART 3: Experimental Design	
◆ Variables.....	11
◆ Constants and Controls.....	13
◆ Experiment Replication, Sample Size, and Reproducibility of Results.....	16
◆ Experimental Set-up.....	17
PART 4: Graphing and Analyzing Data and Making Conclusions [Embedded Skills]	
◆ Using and Interpreting Data Tables.....	22
◆ Using and Interpreting Diagrams and Pie Charts.....	32
◆ Using and Interpreting Bar Charts.....	36
◆ Using and Interpreting Line Graphs.....	41
PART 5: Investigational Errors and Invalid Conclusions [Embedded Skills].....	47
TOPIC C: Laboratory Tools and Technology	
PART 1: Selecting the Appropriate Tool for the Task [Embedded Skills].....	55
PART 2: Making Accurate Measurements.....	59
PART 3: Using Mathematical Relationships to Analyze Measurements [Embedded Skills].....	66
TOPIC D: Laboratory Safety Practices and Equipment.....	71
TOPIC E: Biology Careers [Embedded Skills].....	76

CHAPTER TWO — UNITY & DIVERSITY OF LIFE

TOPIC A: Cell Theory.....	79
TOPIC B: Structure and Function of Eukaryotic Cells	
PART 1: General Cell Organelles.....	80
PART 2: Comparing Eukaryotic Animal and Plant Cells.....	83
TOPIC C: Cellular Activities	
PART 1: Membrane Functions (Diffusion and Osmosis).....	87
PART 2: Cellular Respiration in Animals and Plants.....	91
PART 3: Photosynthesis in Plants.....	99
PART 4: Comparison of Photosynthesis and Cellular Respiration.....	104
PART 5: Applying Your Knowledge of Cellular Activities [Embedded Skills].....	106
TOPIC D: Basic Cellular Biochemistry	
PART 1: Biosynthesis.....	110
PART 2: Enzymes	
◆ Enzymes as Catalysts.....	114
◆ Factors Affecting Enzyme Action (Temperature and pH).....	118
TOPIC E: Taxonomy and Dichotomous Keys	
PART 1: History of Classification Systems.....	121
PART 2: Kingdoms, Phyla, Classes, Orders, Families, Genera, and Species.....	123
PART 3: Dichotomous Keys.....	125
TOPIC F: Simple Organisms (Bacteria, Protists, and Fungi)	
PART 1: Prokaryotic Cell Structure and Bacteria (Kingdoms Archaeobacteria and Eubacteria).....	138
PART 2: Protists (Kingdom Protista).....	139
PART 3: Fungi (Kingdom Fungi).....	141
PART 4: Applying Your Knowledge of Simple Organisms [Embedded Skills].....	142

CHAPTER THREE — BIOLOGICAL STRUCTURE & MAINTENANCE IN ANIMALS & PLANTS

TOPIC A: Biological Structure and Maintenance in Animals

PART 1: Animal Nutrition	145
PART 2: Transport (Circulatory) Systems	146
PART 3: Respiration Systems	148
PART 4: Excretory Systems	150
PART 5: Regulation	
◆ Animal Regulation Systems	151
◆ Nervous Regulation	152
◆ Chemical (Endocrine) Regulation	155
◆ Maintaining Internal Temperatures in Animals [Embedded Skills]	157
PART 6: Locomotion	158
PART 7: Reproduction and Growth	
◆ Asexual Reproduction	159
◆ Internal and External Fertilization	162
◆ Gestation and Embryo Development	164
◆ Animal Life Cycles	167
PART 8: Animal Behavior	168

TOPIC B: Biological Structure and Maintenance in Plants

PART 1: Plant Nutrition	176
PART 2: Transport (Water and Nutrient Movement)	176
PART 3: Excretion (Gas Exchange)	177
PART 4: Regulation Systems	
◆ Osmotic Regulation (Transpiration)	180
◆ Chemical Regulation (Hormones)	183
PART 5: Plant Movement	
◆ Tropisms	185
◆ Nastic and Rapid Response Movements	191
PART 6: Structural and Physiological Adaptations to Environment	193
PART 7: Reproduction and Growth	
◆ Pollination and Seed Formation	196
◆ Seed Dispersal and Germination	200
◆ Lifecycles of Angiosperms, Gymnosperms, and Ferns	202

CHAPTER FOUR — HUMAN ANATOMY & PHYSIOLOGY: NUTRIENT & GAS EXCHANGE, LOCOMOTION & SUPPORT, & REPRODUCTION

TOPIC A: Digestive System

PART 1: Digestive System Structure and Function	207
PART 2: Role of Bacteria in Human Digestion	210
PART 3: Nutrition and Exercise	212
PART 4: Digestive System Disorders	214
PART 5: Applying Your Knowledge of the Digestive System [Embedded Skills]	216

TOPIC B: Circulatory System

PART 1: Circulatory System Structure and Function	218
PART 2: Blood and the Lymphatic System	221
PART 3: Circulatory System Disorders	222
PART 4: Applying Your Knowledge of the Circulatory System [Embedded Skills]	224

TOPIC C: Respiratory System

PART 1: Respiratory System Structure and Function	225
PART 2: Respiratory System Disorders	228
PART 3: Applying Your Knowledge of the Respiratory System [Embedded Skills]	230

TOPIC D: Excretory System

PART 1: Excretory System Structure and Function	232
PART 2: Excretory System Disorders	234
PART 3: Applying Your Knowledge of the Excretory System [Embedded Skills]	235

TOPIC E: Musculoskeletal System

PART 1: Skeletal System Structure and Function	236
PART 2: Muscular System Structure and Function	237

PART 3: Musculoskeletal System Disorders.....	239
PART 4: Applying Your Knowledge of the Musculoskeletal System [Embedded Skills].....	241
TOPIC F: Reproductive System	
PART 1: Reproductive System Structure and Function	
◆ The Female Reproductive System	242
◆ The Male Reproductive System.....	244
◆ Gamete Formation (Ova and Sperm Cells).....	245
◆ Gender Determination.....	247
◆ Fertilization and Embryo Development.....	248
◆ Pregnancy	251
PART 2: Reproductive System Disorders.....	252
PART 3: Applying Your Knowledge of the Reproductive System [Embedded Skills]	253

CHAPTER FIVE — HUMAN ANATOMY & PHYSIOLOGY: REGULATION, IMMUNITY, & HOMEOSTASIS

TOPIC A: Endocrine System	
PART 1: Endocrine System Structure and Function.....	257
PART 2: Endocrine System Disorders.....	260
PART 3: Applying Your Knowledge of the Endocrine System [Embedded Skills].....	264
TOPIC B: Nervous System	
PART 1: Central Nervous System Structure and Function.....	265
PART 2: Peripheral Nervous System Structure and Function	268
PART 3: Nervous System Disorders	272
PART 4: Applying Your Knowledge of the Nervous System [Embedded Skills]	275
TOPIC C: Immune System	
PART 1: Skin, The First Line of Defense.....	277
PART 2: Innate Immune Response.....	279
PART 3: Acquired Immune Response	
◆ Cell-Mediated Immune Response.....	280
◆ Humoral Immune Response.....	280
PART 4: Acquired Immunological Memory (Passive vs. Active).....	281
PART 5: Attacking Pathogens (Bacteria and Viruses)	
◆ Bacterial Pathogens and Antibiotics	284
◆ Viral Pathogens and Vaccines	285
PART 6: Immune System Disorders	
◆ Allergies, Infections, and Transfusions	288
◆ Compromised Immune Systems and AIDS	290
PART 7: Applying Your Knowledge of the Immune System [Embedded Skills].....	293
TOPIC D: Homeostasis and Feedback Regulation [Embedded Skills]	297
TOPIC E: Evaluating Promotional Claims in Medicine [Embedded Skills]	303

CHAPTER SIX — GENETICS

TOPIC A: Traditional Genetics	
PART 1: Mendel's First Law (Dominance)	305
PART 2: Mendel's Second Law (Segregation)	310
PART 3: Mendel's Third Law (Independent Assortment)	314
PART 4: Deviations From Mendelian Inheritance	316
PART 5: Linkage.....	320
PART 6: Environmental Influence on Phenotype [Embedded Skills].....	321
TOPIC B: Modern Genetics	
PART 1: Genes and Gene Expression	
◆ DNA Structure and Function	326
◆ DNA Replication	329
◆ RNA Structure and Transcription.....	331
◆ tRNA and Translation.....	334
PART 2: Chromosome Structure and Segregation	
◆ Chromosomes	337
◆ Mitosis	338
◆ Meiosis.....	342

PART 3: Gene and Chromosomal Mutations	
◆ Mutations and Mutagens	346
◆ Gene Mutations	347
◆ Chromosomal Mutations	350
◆ Tracking Genetic Disorders With Pedigrees	354
PART 4: Biotechnology	
◆ Biotechnology Techniques	355
◆ Products and Ethical Considerations of Genetic Engineering [Embedded Skills]	359
◆ Process and Ethical Considerations of Cloning [Embedded Skills]	364
◆ Process and Ethical Considerations of Stem Cell Research [Embedded Skills]	371
◆ Model Organisms for Research and the Human Genome Project [Embedded Skills]	376

CHAPTER SEVEN — EVOLUTION & DIVERSITY OF LIFE

TOPIC A: Evidence for Evolution	
PART 1: Fossil Record and Preserved Fossil Evidence	379
PART 2: Comparative Biochemistry	383
PART 3: Comparative Anatomy (Homologous, Analogous, and Vestigial Structures)	385
PART 4: Comparative Embryology	390
TOPIC B: Development of the Theory of Evolution	
PART 1: Historical Theories of the Diversity of Life [Embedded Skills]	393
PART 2: Theory of Evolution by Natural Selection [Embedded Skills]	395
TOPIC C: Mechanisms of Natural Selection	
PART 1: Variations in Populations Lead to Ecosystem Diversity	397
PART 2: Advantageous Traits That Cause Reproductive Advantages	401
PART 3: Competition and New Niches Increase Natural Selection	404
PART 4: Increased Frequency of Advantageous Traits Over Time	407
TOPIC D: Speciation	416
TOPIC E: Theories on Patterns and Rates of Evolution [Embedded Skills]	419
TOPIC F: Fields of Study in Evolutionary Biology	
PART 1: Cladistics and Phylogenetics	423
PART 2: Population Genetics: Hardy-Weinberg Principle [Embedded Skills]	426
PART 3: Population Genetics (Genetic Drift)	428
TOPIC G: Theories on the Origin of Life [Embedded Skills]	430

CHAPTER EIGHT — ECOLOGICAL ORGANIZATION & INTERACTIONS

TOPIC A: Ecological Organization	433
TOPIC B: Abiotic and Biotic Factors	435
TOPIC C: Abiotic and Biotic Interactions	
PART 1: Niches	437
PART 2: Predator/Prey Relationships	441
PART 3: Scavengers	445
PART 4: Symbiosis	
◆ Types of Symbiosis	446
◆ Parasitism	449
◆ Mutualism	451
◆ Commensalism and Saprophytism	454
TOPIC D: Food Chains and Webs	
PART 1: Producers and Consumers	456
PART 2: Aquatic Examples	
◆ Fresh Water Food Webs	461
◆ Salt Water Food Webs	466
PART 3: Terrestrial Examples	473
PART 4: Decomposers in the Food Web	479
TOPIC E: Energy Flow and Biomass in the Ecosystem	
PART 1: Flow of Energy in the Ecosystem	483
PART 2: Biomass and Food Pyramids	486
PART 3: Energy in Food Webs and Food Pyramids	489

TOPIC F: Birth Rates, Death Rates, and Population Density	
PART 1: Size and Growth of Populations	493
PART 2: Carrying Capacity	496

CHAPTER NINE — ECOLOGY: CYCLES, BIODIVERSITY, & PRESERVATION

TOPIC A: Cycles in the Environment	
PART 1: Carbon and Oxygen Cycles	501
PART 2: Water and Nitrogen Cycles	504
TOPIC B: Ecological Succession	
PART 1: Pioneer Organisms and Climax Communities	507
PART 2: Primary and Secondary Succession	508
PART 3: Aquatic Succession in Lakes and Ponds	512
TOPIC C: Biomes	516
TOPIC D: Biodiversity	512
TOPIC E: Negative Effects of Humans [Embedded Skills]	
PART 1: Air Pollution	
◆ Smog and Acid Rain	524
◆ Greenhouse Gases	528
◆ Ozone Depletion	529
PART 2: Water Pollution	530
PART 3: Species and Habitat Destruction	533
PART 4: Introduction of Non-native Species to the Environment	536
PART 5: Pesticide Use	538
PART 6: Industrial Wastes	541
PART 7: Non-renewable Resource Depletion	543
TOPIC F: Positive Contributions of Humans [Embedded Skills]	
PART 1: Pollution Prevention	545
PART 2: Ecosystem Preservation	547
PART 3: Wildlife Preservation and Management	548
PART 4: Agriculture and the Green Revolution	550
PART 5: Biological Controls for Pest Management	551
PART 6: Development of Alternative Energies	553
PART 7: Recycling and Conservation	556

