

TABLE OF CONTENTS

MODULE 1	3
INTRODUCTION TO ANATOMY AND PHYSIOLOGY	
Organizational Levels of the Human Body	5
Homeostasis	9
Control of Homeostasis: Feedback Systems	11
A Review of Cell Structure and Organelle Function	13
A Review of Protein Synthesis	17
A Review of Cellular Mitosis	19
The Plasma Membrane	21
Functions of the Plasma Membrane	23
Membrane Transport Processes	27
Answers to the “On Your Own” Questions	32
Study Guide for Module 1	34
MODULE 2	36
HISTOLOGY: THE STUDY OF TISSUES	
Epithelial Tissue	37
Stratified Epithelial Tissue	41
Glandular Epithelium	44
Connective Tissue	52
Connective Tissue Proper	53
Cartilage	57
Bone and Blood	60
Membranes	60
Tissue Repair	62
Answers to the “On Your Own” Questions	65
Study Guide for Module 2	66

MODULE 3	68
THE INTEGUMENTARY AND SKELETAL SYSTEMS	
The Basic Structure of Skin	69
A Closer Look at the Epidermis	74
Hair and Nails	78
Skin Glands	84
The Skeletal System	85
Gross Anatomy of Bone	87
An Overview of the Skeletal System	91
Details of the Appendicular Skeleton: The Limbs	93
Details of the Appendicular Skeleton: The Hands and Feet . . .	94
Details of the Axial Skeleton: The Skull	95
Details of the Axial Skeleton: The Vertebral Column	99
Details of the Axial Skeleton: The Thoracic Cage	102
Answers to the “On Your Own” Questions	105
Study Guide for Module 3	107
MODULE 4	110
THE SKELETAL SYSTEM HISTOLOGY AND MOVEMENT	
Cancellous and Compact Bone Histology	114
Bone Growth and Bone Remodeling	117
Bone Homeostasis	123
Nutrition for Bone Health	126
The Three Major Types of Joints in the Skeleton	127
Motion and Terms of Movement	132
Answers to the “On Your Own” Questions	136
Study Guide for Module 4	138
MODULE 5	140
THE MUSCULAR SYSTEM HISTOLOGY AND PHYSIOLOGY	
Skeletal Muscle Structure	142
How a Muscle Fiber Contracts	145
The Neuromuscular Junction in a Skeletal Muscle	152
How a Muscle Fiber Relaxes	157
Motor Units	158
Multiple Motor Unit Summation	159
Muscle Tone	162
Energy in Skeletal Muscle Fibers	162
Warm-up and Cool-down	165
Summing Up	165
Answers to the “On Your Own” Questions	166
Study Guide for Module 5	167

MODULE 6 170

THE SKELETAL MUSCLE SYSTEM

An Overview of the Skeletal Muscle System 174

Major Muscles of the Head and Face 176

Major Muscles of the Anterior Chest and Abdominal Wall. . 178

The Major Muscles of the Shoulder, Back, and Arm 180

Major Muscles of the Forearm 181

Muscles of the Hand. 184

Major Muscles of the Thigh 185

Major Muscles of the Leg 187

The Muscles of the Foot 190

Summing Up 190

Answers to the “On Your Own” Questions 191

Study Guide for Module 6 192

MODULE 7 196

THE NERVOUS SYSTEM

The Nervous System at the Cellular Level. 200

Neuroglia 203

Nerve Structure. 206

Action Potentials I: The Resting Potential 208

Action Potentials II: Stimulus and Response 211

Action Potentials III: Stimulus and Conduction. 215

Synaptic Transmission. 221

Neuron Arrangements. 227

Answers to the “On Your Own” Questions 229

Study Guide for Module 7 231

MODULE 8 234

THE CENTRAL NERVOUS SYSTEM

The Brain 234

The Cerebrum in More Detail. 242

Other Important Structures in the Brain 247

Protection of the Brain 250

The Spinal Cord 253

The Reflex Arc 256

Ascending and Descending Pathways in the Spinal Cord. . . 259

Answers to the “On Your Own” Questions 264

Study Guide for Module 8 265

MODULE 9 268

THE PERIPHERAL NERVOUS SYSTEM

Divisions of the Autonomic Nervous System..... 270
Control of the Autonomic Nervous System..... 275
The Afferent Division of the Peripheral Nervous System... 276
The General Senses 281
The Sense of Taste..... 287
The Sense of Balance..... 289
The Sense of Hearing 293
The Sense of Vision: Eye Anatomy 295
The Sense of Vision: Physiology of the Eye 303
Answers to the “On Your Own” Questions 308
Study Guide for Module 9 310

MODULE 10 314

THE ENDOCRINE SYSTEM

The Endocrine System as a Whole..... 316
Endocrine Glands and Hormones 318
Hormone Chemistry 326
Hormone Secretion Control 327
Patterns of Hormone Secretion 332
Hormone Receptors in
the Body 333
Prostaglandins..... 335
Answers to the “On Your Own” Questions 337
Study Guide for Module 10 338

MODULE 11 340

THE CARDIOVASCULAR SYSTEM

The Composition of Blood 341
The Formed Elements in Blood 344
Blood as a Connective Tissue 351
Blood Types 358
An Overview of Blood Circulation 362
Heart Anatomy..... 364
Cardiac Muscle and the Cardiac Cycle 370
Blood Vessels and the Entire Circulatory System..... 372
Answers to the “On Your Own” Questions 376
Study Guide for Module 11 378

MODULE 12 382

THE LYMPHATIC SYSTEM

Lymph and Lymph Vessels 384
Functions of the Lymphatic System 385
Lymph Nodes 391
The Spleen and the Thymus Gland 392
Immunity 394
The First Line of Innate (Nonspecific) Immunity 395
The Second Line of Innate Defense 397
Acquired Immunity, Part 1: Humoral Immunity 399
Acquired Immunity, Part 2: Cell-Mediated Immunity 403
Types of Acquired Immunity and Autoimmunity 403
Answers to the “On Your Own” Questions 405
Study Guide for Module 12 406

MODULE 13 408

THE DIGESTIVE SYSTEM

Overview of the Digestive System 409
The Mouth, Pharynx, and Esophagus 413
The Stomach 418
The Small Intestine 424
The Large Intestine 428
Accessory Organs: The Liver, Pancreas, and GallBladder ... 431
Nutrition 437
Micronutrients 439
Answers to the “On Your Own” Questions 441
Study Guide for Module 13 442

MODULE 14 444

THE RESPIRATORY SYSTEM

Anatomy and Functions of the Respiratory System 444
Voice 448
The Muscles and Mechanics of Ventilation 450
Factors That Aid Ventilation 453
External Respiration 458
Gas Exchange During External and Internal Respiration ... 464
Respiratory Control 467
Cellular Respiration 470
Stage 1 of Cellular Respiration: Glycolysis 470
Stage 2 of Cellular Respiration: Oxidation of Pyruvate 473
Stage 3 of Cellular Respiration: Citric Acid (Krebs) Cycle ... 474
Stage 4 of Cellular Respiration: Electron Transport Chain .. 475
Review of Cellular Respiration 478
Answers to the “On Your Own” Questions 481
Study Guide for Module 14 483

MODULE 15	486
THE URINARY SYSTEM	
Anatomy of the Urinary System	487
Urine Formation: The Overall Scheme	490
Urine Formation, Step 1: Glomerular Filtration	493
Urine Formation, Step 3: Secretion	498
Urine Formation, Step 4: Reabsorption of Water	498
Storage and Release of Urine.	502
Blood Pressure Control by the Kidneys	503
Acid-Base Balance in the Body	504
Answers to the “On Your Own” Questions	511
Study Guide for Module 15	513
MODULE 16	516
THE REPRODUCTIVE SYSTEMS	
Anatomy of the Male Reproductive System.	517
Meiosis	521
Spermatogenesis: Development of Sperm	524
Hormonal Control of Male Reproduction	528
Anatomy of the Female Reproductive System	530
Oogenesis: Development of the Ovum	532
The Menstrual Cycle.	535
Fertilization, Development, and Parturition	539
Answers to the “On Your Own” Questions	546
Study Guide for Module 16	548
APPENDIX	551
Glossary	551
Index.	561