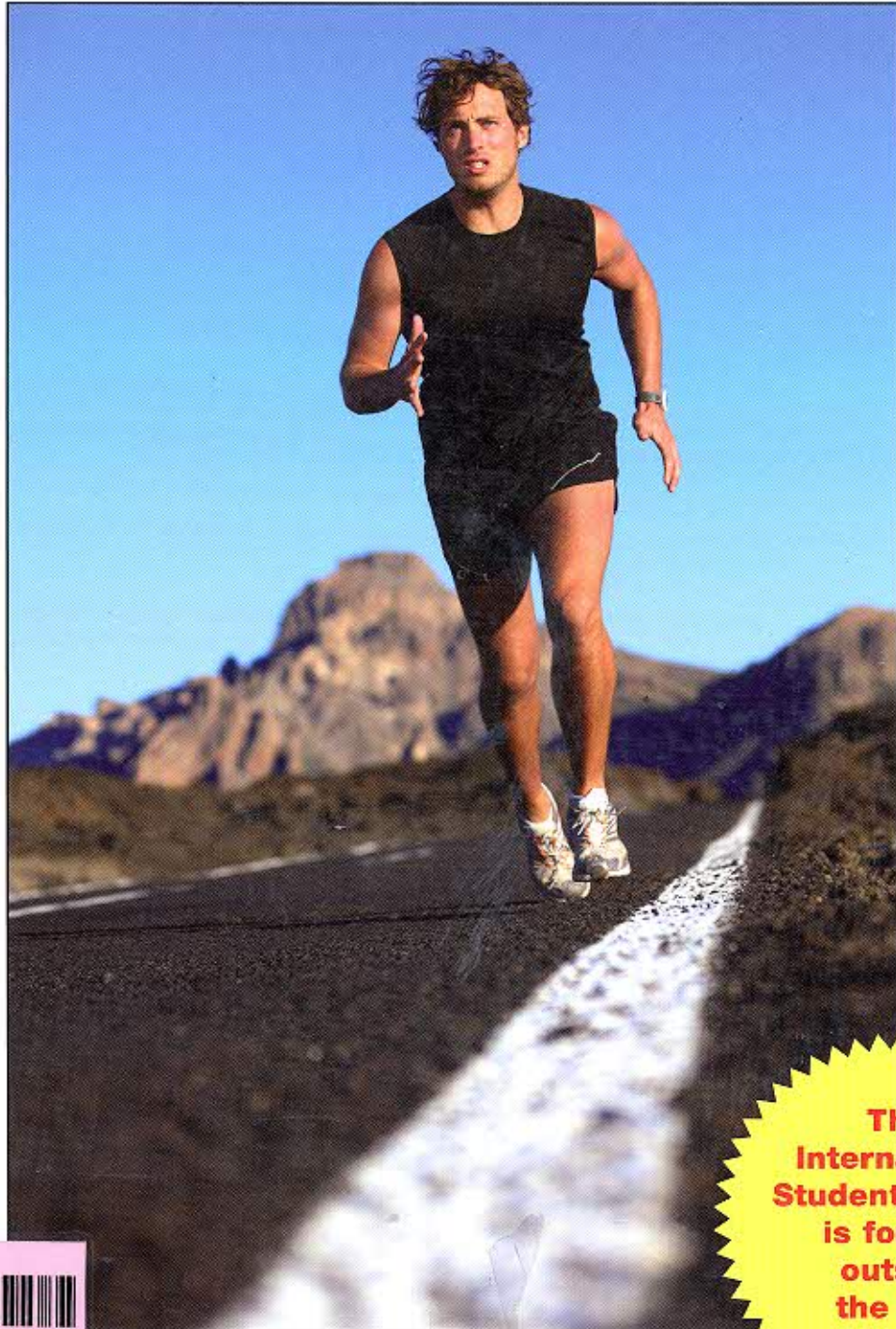


Kenneth S. Saladin / Robin K. McFarland

Essentials of Anatomy & Physiology



**This
International
Student Edition
is for use
outside
the U.S.**



10040003

ห้องสมุด วพบ. สุรินทร์

McGraw-Hill INTERNATIONAL EDITION



Table of Contents

Preface x

PART 1

Organization of the Body



Chapter 1

The Study of Anatomy and Physiology 1

- 1.1 Anatomy—The Structural Basis of Human Function 2
- 1.2 Physiology—The Functional Relevance of Human Structure 8
- 1.3 The Human Body Plan 14
- 1.4 The Language of Medicine 24
 - Perspectives on Health* 9
 - Career Spotlight—Radiologic Technologist* 27
 - Study Guide* 28

Chapter 2

Life, Matter, and Energy 31

- 2.1 Atoms, Ions, and Molecules 32
- 2.2 Water, Mixtures, and pH 38

- 2.3 Organic Compounds 43
- 2.4 Energy and Chemical Reactions 56
 - Perspectives on Health* 54
 - Career Spotlight—Medical Technologist* 59
 - Study Guide* 60

Chapter 3

Cytology—The Cellular Level of Organization 63

- 3.1 The General Structure of Cells 64
- 3.2 The Cell Surface 66
- 3.3 The Cell Interior 78
- 3.4 The Life Cycle of Cells 87
 - Perspectives on Health* 92
 - Career Spotlight—Cytotechnologist* 93
 - Study Guide* 94

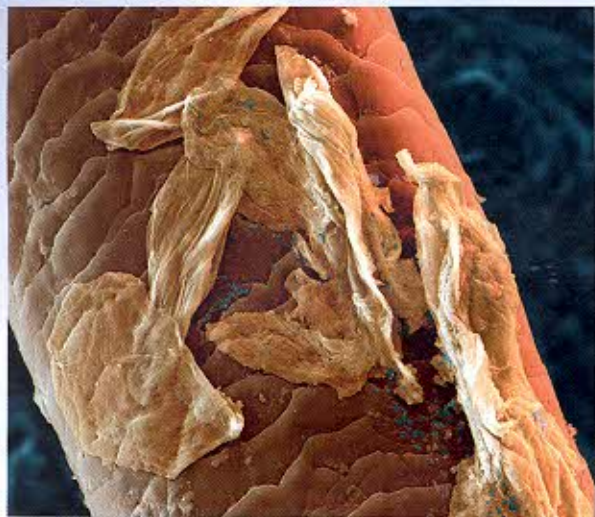
Chapter 4

Histology—The Tissue Level of Organization 97

- 4.1 The Study of Tissues 98
- 4.2 Epithelial Tissue 101
- 4.3 Connective Tissue 108
- 4.4 Nervous and Muscular Tissues—The Excitable Tissues 116
- 4.5 Glands and Membranes 120
- 4.6 Tissue Growth, Development, Repair, and Death 124
 - Perspectives on Health* 119
 - Career Spotlight—Histotechnician* 125
 - Study Guide* 126

PART 2

Support and Movement



Chapter 5

The Integumentary System 129

- 5.1 The Skin and Subcutaneous Tissue 130
- 5.2 Accessory Organs 137
 - Perspectives on Health* 136
 - Aging of the Integumentary System* 143
 - Career Spotlight—Dermatology Nurse* 143
 - Connective Issues* 144
 - Study Guide* 145

Chapter 6

The Skeletal System 147

- 6.1 Skeletal Structure and Function 148
- 6.2 Bone Development and Metabolism 154
- 6.3 The Axial Skeleton 161
- 6.4 The Appendicular Skeleton 177
- 6.5 Joints 186
 - Perspectives on Health* 160
 - Aging of the Skeletal System* 198
 - Career Spotlight—Orthopedic Nurse* 198
 - Connective Issues* 199
 - Study Guide* 200

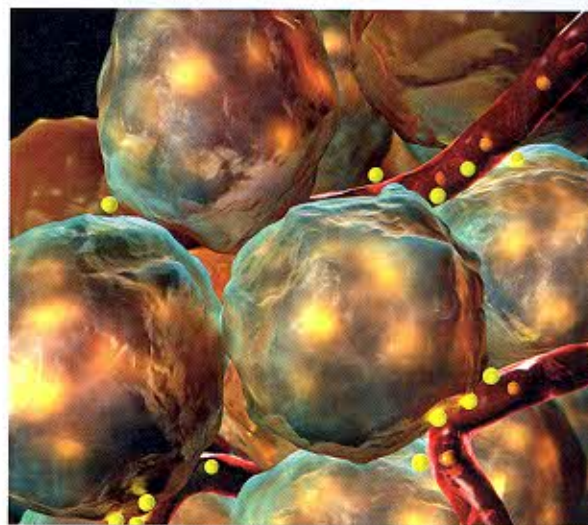
Chapter 7

The Muscular System 203

- 7.1 Muscular Tissue and Cells 204
- 7.2 Physiology of Skeletal Muscle 212
- 7.3 Cardiac and Smooth Muscle 222
- 7.4 Anatomy of the Muscular System 225
 - Perspectives on Health* 227
 - Career Spotlight—Massage Therapist* 245
 - Aging of the Muscular System* 249
 - Connective Issues* 250
 - Study Guide* 251

PART 3

Internal Coordination



Chapter 8

The Nervous System I—Nerve Cells, the Spinal Cord, and Reflexes 255

- 8.1 Cells and Tissues of the Nervous System 256
- 8.2 The Physiology of Neurons 264
- 8.3 The Spinal Cord, Spinal Nerves, and Reflexes 273
 - Perspectives on Health* 272
 - Career Spotlight—Occupational Therapist* 284
 - Study Guide* 285

Chapter 9

The Nervous System II—The Brain, Cranial Nerves, and Autonomic Nervous System 288

- 9.1 Overview of the Brain 289
- 9.2 Principal Divisions of the Brain 296
- 9.3 Multiregional Brain Functions 303
- 9.4 The Cranial Nerves 310
- 9.5 The Autonomic Nervous System 312
 - Aging of the Nervous System* 320
 - Perspectives on Health* 320
 - Career Spotlight—Electroneurodiagnostic Technologist* 322
 - Connective Issues* 323
 - Study Guide* 324

Chapter 10

The Sense Organs 327

- 10.1 Receptors and Sensations 328
- 10.2 The General Senses 331
- 10.3 The Chemical Senses—Taste and Smell 334
- 10.4 The Ear—Equilibrium and Hearing 338
- 10.5 The Eye and Vision 347
 - Aging of the Sense Organs* 358
 - Career Spotlight—Optician* 358
 - Perspectives on Health* 359
 - Study Guide* 360

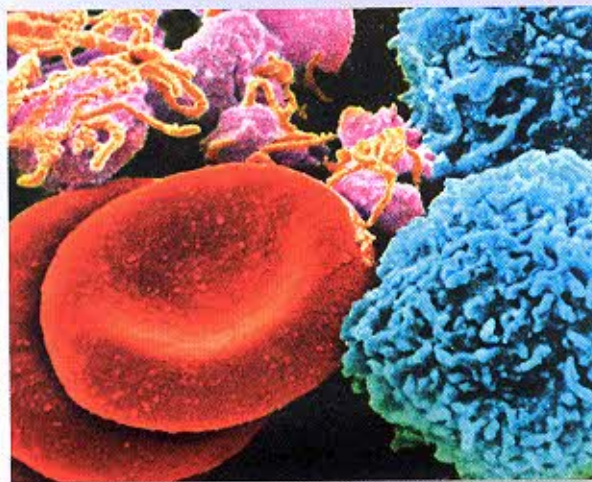
Chapter 11

The Endocrine System 363

- 11.1 Overview of the Endocrine System 364
- 11.2 Endocrine Physiology 367
- 11.3 The Hypothalamus and Pituitary Gland 370
- 11.4 Other Endocrine Glands and Tissues 376
- 11.5 Stress Physiology 385
 - Perspectives on Health* 384
 - Aging of the Endocrine System* 386
 - Career Spotlight—Diabetes Educator* 386
 - Connective Issues* 387
 - Study Guide* 388

PART 4

Circulation and Defense



Chapter 12

The Circulatory System I—Blood 391

- 12.1 Introduction 392
- 12.2 Erythrocytes 396
- 12.3 Leukocytes 402
- 12.4 Platelets 408
 - Perspectives on Health* 406
 - Career Spotlight—Phlebotomist* 412
 - Connective Issues* 413
 - Study Guide* 414

Chapter 13

The Circulatory System II—Heart and Blood Vessels 417

- 13.1 Overview of the Cardiovascular System 418
- 13.2 Gross Anatomy of the Heart 421
- 13.3 Physiology of the Heart 428
- 13.4 General Anatomy of Blood Vessels 436
- 13.5 Physiology of Circulation 442
- 13.6 Circulatory Routes and Blood Vessels 448
 - Perspectives on Health* 427
 - Aging of the Circulatory System* 464
 - Career Spotlight—Electrocardiographic Technician* 465
 - Connective Issues* 466
 - Study Guide* 467

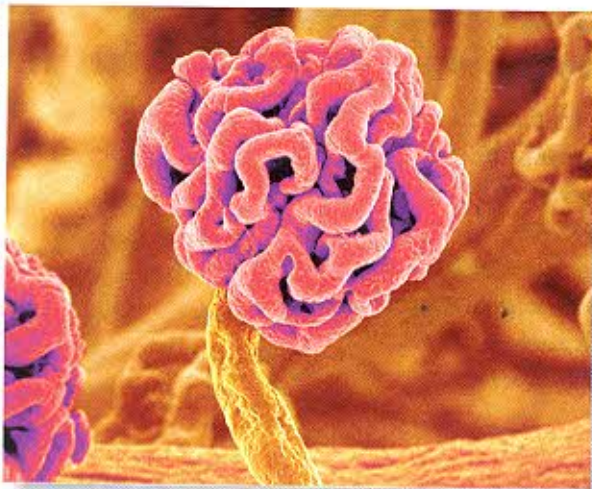
Chapter 14

The Lymphatic System and Immunity 470

- 14.1 The Lymphatic System 471
- 14.2 Nonspecific Resistance 480
- 14.3 Features of Adaptive Immunity 486
- 14.4 Cellular and Humoral Immunity 490
 - Perspectives on Health* 497
 - Aging of the Lymphatic and Immune Systems* 498
 - Career Spotlight—Public Health Nurse* 498
 - Connective Issues* 499
 - Study Guide* 500

PART 5

Intake and Output



Chapter 15

The Respiratory System 503

- 15.1 Functions and Anatomy of the Respiratory System 504
- 15.2 Pulmonary Ventilation 514
- 15.3 Gas Exchange and Transport 520
 - Perspectives on Health* 519
 - Aging of the Respiratory System* 524
 - Career Spotlight—Respiratory Therapist* 524
 - Connective Issues* 525
 - Study Guide* 526

Chapter 16

The Urinary System 529

- 16.1 Functions of the Urinary System 530
- 16.2 Anatomy of the Kidney 532
- 16.3 Glomerular Filtration 537
- 16.4 Tubular Reabsorption and Secretion 543
- 16.5 Water Conservation 546
- 16.6 Urine Storage and Elimination 548
- 16.7 Fluid, Electrolyte, and Acid–Base Balance 553
 - Perspectives on Health* 548
 - Aging of the Urinary System* 558
 - Career Spotlight—Dialysis Technician* 558
 - Connective Issues* 559
 - Study Guide* 560

Chapter 17

The Digestive System 563

- 17.1 Overview of the Digestive System 564
- 17.2 The Mouth Through Esophagus 568
- 17.3 The Stomach 572
- 17.4 The Liver, Gallbladder, and Pancreas 579
- 17.5 The Small Intestine 584
- 17.6 Chemical Digestion and Absorption 588
- 17.7 The Large Intestine 592
 - Perspectives on Health* 579
 - Aging of the Digestive System* 596
 - Career Spotlight—Dental Hygienist* 596
 - Connective Issues* 597
 - Study Guide* 598

Chapter 18

Nutrition and Metabolism 601

- 18.1 Nutrition 602
- 18.2 Carbohydrate Metabolism 611
- 18.3 Lipid and Protein Metabolism 615
- 18.4 Metabolic States and Metabolic Rate 618
- 18.5 Energy Balance and Appetite Regulation 621
- 18.6 Body Heat and Thermoregulation 624
 - Perspectives on Health* 610
 - Career Spotlight—Dietitian* 627
 - Study Guide* 628

PART 6

Human Life Cycle



Chapter 19

The Reproductive System 631

- 19.1 Essentials of Sexual Reproduction 632
- 19.2 The Male Reproductive System 633
- 19.3 The Female Reproductive System 641
- 19.4 The Production and Union of Sex Cells 649
- 19.5 Pregnancy, Childbirth, and Lactation 664

Perspectives on Health 663

Aging of the Reproductive System 670

Career Spotlight—Midwife 670

Connective Issues 671

Study Guide 672

Chapter 20

Human Development and Aging 675

- 20.1 Fertilization and Preembryonic Development 676
- 20.2 The Embryonic and Fetal Stages 683
- 20.3 The Neonate 694
- 20.4 Aging, Senescence, and Death 699
 - Perspectives on Health* 693
 - Career Spotlight—Genetic Counselor* 703
 - Study Guide* 704

Appendix A: Answer Keys A-1

Appendix B: Health Science Careers A-7

Appendix C: Symbols, Weights, and Measures A-10

Appendix D: Biomedical Word Roots, Prefixes, and Suffixes A-12

Glossary G-1

Credits C-1

Index I-1