

802

Medical Physiology

Principles for Clinical Medicine

THIRD EDITION

RODNEY A. RHOADES

DAVID R. BELL

Contents

Preface v
Contributors vii

PART I **CELLULAR PHYSIOLOGY 1**

- CHAPTER 1** Homeostasis and Cellular Signaling 1
Patricia J. Gallagher, Ph.D.
- CHAPTER 2** The Plasma Membrane, Membrane Transport, and Resting Membrane Potential 20
Stephen A. Kempson, Ph.D.
- CHAPTER 3** The Action Potential, Synaptic Transmission, and Maintenance of Nerve Function 38
Cynthia J. Forehand, Ph.D.

PART II **NEUROMUSCULAR PHYSIOLOGY 65**

- CHAPTER 4** Sensory Physiology 65
Richard A. Meiss, Ph.D.
- CHAPTER 5** The Motor System 93
John C. Kincaid, M.D.
- CHAPTER 6** The Autonomic Nervous System 111
John C. Kincaid, M.D.
- CHAPTER 7** Integrative Functions of the Nervous System 122
Cynthia J. Forehand, Ph.D.
- CHAPTER 8** Skeletal and Smooth Muscle 140
Richard A. Meiss, Ph.D.

PART III **BLOOD AND IMMUNOLOGY 169**

- CHAPTER 9** Blood Components 169
Gabi Nindl Waite, Ph.D.
- CHAPTER 10** Immunology, Organ Interaction, and Homeostasis 187
Gabi Nindl Waite, Ph.D.

PART IV **CARDIOVASCULAR PHYSIOLOGY 207**

- CHAPTER 11** An Overview of the Cardiovascular System and Hemodynamics 207
David R. Bell, Ph.D.

- CHAPTER 12** The Electrical Activity of the Heart 221
David R. Bell, Ph.D.
- CHAPTER 13** Cardiac Muscle Mechanics and the Cardiac Pump 243
David R. Bell, Ph.D.
- CHAPTER 14** The Systemic Circulation 263
David R. Bell, Ph.D.
- CHAPTER 15** The Microcirculation and Lymphatic System 274
David R. Bell, Ph.D.
- CHAPTER 16** Special Circulations 290
David R. Bell, Ph.D.
- CHAPTER 17** Control Mechanisms in Circulatory Function 305
David R. Bell, Ph.D.

PART V **RESPIRATORY PHYSIOLOGY 319**

- CHAPTER 18** Ventilation and the Mechanics of Breathing 319
Rodney A. Rhoades, Ph.D.
- CHAPTER 19** Gas Transfer and Transport 348
Rodney A. Rhoades, Ph.D.
- CHAPTER 20** Pulmonary Circulation and Ventilation-Perfusion 361
Rodney A. Rhoades, Ph.D.
- CHAPTER 21** The Control of Ventilation 374
Rodney A. Rhoades, Ph.D.

PART VI **RENAL PHYSIOLOGY AND BODY FLUIDS 391**

- CHAPTER 22** Kidney Function 391
George A. Tanner, Ph.D.
- CHAPTER 23** The Regulation of Fluid and Electrolyte Balance 419
George A. Tanner, Ph.D.
- CHAPTER 24** Acid-Base Balance 442
George A. Tanner, Ph.D.

PART VII **GASTROINTESTINAL PHYSIOLOGY 463**

- CHAPTER 25** Neurogastroenterology and Motility 463
Jackie D. Wood, Ph.D.

CHAPTER 26 Gastrointestinal Secretion, Digestion, and Absorption 497
Patrick Tso, Ph.D.

CHAPTER 27 The Physiology of the Liver 530
Patrick Tso, Ph.D.

PART VIII

TEMPERATURE REGULATION AND EXERCISE PHYSIOLOGY 543

CHAPTER 28 The Regulation of Body Temperature 543
Frank A. Witzmann, Ph.D.

CHAPTER 29 Exercise Physiology 567
Frank A. Witzmann, Ph.D.

PART IX

ENDOCRINE PHYSIOLOGY 581

CHAPTER 30 Endocrine Control Mechanisms 581
Jeffrey S. Elmendorf, Ph.D.

CHAPTER 31 The Hypothalamus and the Pituitary Gland 596
Robert V. Considine, Ph.D.

CHAPTER 32 The Thyroid Gland 612
Robert V. Considine, Ph.D.

CHAPTER 33 The Adrenal Gland 624
Robert V. Considine, Ph.D.

CHAPTER 34 The Endocrine Pancreas 641
Jeffrey S. Elmendorf, Ph.D.

CHAPTER 35 Endocrine Regulation of Calcium, Phosphate, and Bone Homeostasis 656
Jeffrey S. Elmendorf, Ph.D.

PART X

REPRODUCTIVE PHYSIOLOGY 669

CHAPTER 36 The Male Reproductive System 669
Jeffrey S. Elmendorf, Ph.D.

CHAPTER 37 The Female Reproductive System 687
Robert V. Considine, Ph.D.

CHAPTER 38 Fertilization, Pregnancy, and Fetal Development 705
Robert V. Considine, Ph.D.

Appendix: Common Abbreviations in Physiology 727

Glossary 731

Index 773