

Contents

Preface iii

Acknowledgments iv

1. PLASMA MEMBRANE

1

- I. Overview—The Plasma Membrane (Plasmalemma; Cell Membrane) 1
- II. Fluid Mosaic Model of the Plasma Membrane 1
- III. Plasma Membrane Transport Processes 4
- IV. Cell-to-Cell Communication 7
- V. Plasmalemma–Cytoskeleton Association 9

Review Test 11

Answers and Explanations 13

2. NUCLEUS

14

- I. Overview—The Nucleus 14
- II. Nuclear Envelope 14
- III. Nucleolus 16
- IV. Nucleoplasm 17
- V. Chromatin 17
- VI. Chromosomes 18
- VII. DNA 19
- VIII. RNA 20
- IX. Cell Cycle 23
- X. Apoptosis (Programmed Cell Death) 26
- XI. Meiosis 26

Review Test 29

Answers and Explanations 31

3. CYTOPLASM AND ORGANELLES

32

- I. Overview—The Cytoplasm 32
- II. Structural Components 32
- III. Interactions Among Organelles 45

Review Test 53

Answers and Explanations 55

-
- 4. EXTRACELLULAR MATRIX 56**
- I. Overview—The Extracellular Matrix 56
 - II. Ground Substance 56
 - III. Fibers 59
- Review Test 64
Answers and Explanations 66
-
- 5. EPITHELIA AND GLANDS 67**
- I. Overview—Epithelia 67
 - II. Lateral Epithelial Surfaces 69
 - III. Basal Epithelial Surfaces 71
 - IV. Apical Epithelial Surfaces 72
 - V. Glands 73
- Review Test 76
Answers and Explanations 78
-
- 6. CONNECTIVE TISSUE 79**
- I. Overview—Connective Tissue 79
 - II. Extracellular Matrix 79
 - III. Connective Tissue Cells 80
 - IV. Classification of Connective Tissue 86
- Review Test 89
Answers and Explanations 91
-
- 7. CARTILAGE AND BONE 92**
- I. Overview—Cartilage 92
 - II. Bone 95
 - III. Joints 105
- Review Test 106
Answers and Explanations 108
-
- 8. MUSCLE 109**
- I. Overview—Muscle 109
 - II. Structure of Skeletal Muscle 109
 - III. Contraction of Skeletal Muscle 114
 - IV. Innervation of Skeletal Muscle 116
 - V. Cardiac Muscle 117
 - VI. Smooth Muscle 120
 - VII. Contractile Nonmuscle Cells 122
- Review Test 123
Answers and Explanations 125

9. NERVOUS SYSTEM 126

- I. Overview—Nervous System 126
- II. Histogenesis of the Nervous System 126
- III. Cells of Nervous System 127
- IV. Synapses 132
- V. Nerve Fibers 134
- VI. Nerves 136
- VII. Ganglia 137
- VIII. Histophysiology of Nervous System 138
- IX. Somatic Nervous System and Autonomic Nervous System (ANS) 139
- X. CNS 140
- XI. Degeneration and Regeneration of Nerve Tissue 141

Review Test 144

Answers and Explanations 146

10. BLOOD AND HEMOPOIESIS 148

- I. Overview—Blood 148
- II. Blood Constituents 148
- III. Blood Coagulation 153
- IV. Bone Marrow 154
- V. Prenatal Hemopoiesis 155
- VI. Postnatal Hemopoiesis 155
- VII. Hemopoietic Growth Factors (Colony-Stimulating Factors [CSFs]) 159

Review Test 160

Answers and Explanations 162

11. CIRCULATORY SYSTEM 163

- I. Overview—Blood Vascular System 163
- II. Overview—Lymphatic Vascular System 173

Review Test 174

Answers and Explanations 176

12. LYMPHOID TISSUE 178

- I. Overview—The Lymphoid (Immune) System 178
- II. Cells of the Immune System 179
- III. Antigen Presentation and the Role of MHC Molecules 185
- IV. Immunoglobulins 186
- V. Diffuse Lymphoid Tissue 187
- VI. Lymphoid Organs 188

Review Test 193

Answers and Explanations 195

13. ENDOCRINE SYSTEM 196

- I. Overview—The Endocrine System 196
- II. Hormones 196
- III. Overview—Pituitary Gland (Hypophysis) 196
- IV. Overview—Thyroid Gland 201
- V. Parathyroid Glands 206
- VI. Overview—Adrenal (Suprarenal) Glands 207
- VII. Pineal Gland (Pineal Body, Epiphysis) 211

Review Test 212

Answers and Explanations 214

14. SKIN 215

- I. Overview—The Skin 215
- II. Epidermis 215
- III. Dermis 220
- IV. Glands in the Skin 220
- V. Hair Follicle and Arrector Pili Muscle 222
- VI. Nails 223

Review Test 225

Answers and Explanations 227

15. RESPIRATORY SYSTEM 228

- I. Overview—The Respiratory System 228
- II. Conducting Portion of the Respiratory System 228
- III. Overview—Respiratory Portion of the Respiratory System 233
- IV. Lung Lobules 239
- V. Pulmonary Vascular Supply 239
- VI. Pulmonary Nerve Supply 240

Review Test 241

Answers and Explanations 243

16. DIGESTIVE SYSTEM: ORAL CAVITY AND ALIMENTARY TRACT 244

- I. Overview—The Digestive System 244
- II. Oral Region 244
- III. Divisions of the Alimentary Canal 248
- IV. Digestion and Absorption 257

Review Test 259

Answers and Explanations 261

17. DIGESTIVE SYSTEM: GLANDS 262

- I. Overview—Extrinsic Glands of the Digestive System 262
- II. Major Salivary Glands 262
- III. Overview—Pancreas 263
- IV. Liver 266
- V. Gallbladder 270

Review Test 272

Answers and Explanations 274

18. THE URINARY SYSTEM 275

- I. Overview—The Urinary System 275
- II. Kidneys 275
- III. Uriniferous Tubules 276
- IV. Renal Blood Circulation 284
- V. Regulation of Urine Concentration 286
- VI. Excretory Passages 287

Review Test 291

Answers and Explanations 293

19. FEMALE REPRODUCTIVE SYSTEM 294

- I. Overview—Female Reproductive System 294
- II. Ovaries 294
- III. Oviducts (Fallopian Tubes) 299
- IV. Uterus 300
- V. Cervix 303
- VI. Fertilization and Implantation 303
- VII. Placenta 304
- VIII. Vagina 305
- IX. External Genitalia (Vulva) 305
- X. Mammary Glands 305

Review Test 308

Answers and Explanations 310

20. MALE REPRODUCTIVE SYSTEM 311

- I. Overview—Male Reproductive System 311
- II. Testes 311
- III. Genital Ducts 318
- IV. Accessory Genital Glands 320
- V. Penis 322

Review Test 323

Answers and Explanations 325

21. SPECIAL SENSES**326**

-
- I. Overview—Special Sense Receptors 326
 - II. Specialized Diffuse Receptors 326
 - III. Sense of Sight—Eye 328
 - IV. Sense of Hearing—Ear (Vestibulocochlear Apparatus) 337

Review Test 343

Answers and Explanations 345

Comprehensive Examination 346

Index 365