Contents

Preface *vii*

0. General Physiology xi

Cell xi
Transport of substances across cell xiv
Connection between the adjacent cells xv
Body fluids compartments xvi
Measurement of body fluid volume xix
Body fluid compartments xix
Alterations in the body fluid compartments during certain conditions xx
Dehydration xxii

1. Blood 1

Hematology 1
Functions of blood 1
Composition of blood 1
Plasma 2
Plasma proteins 2
Formed elements 4
Red blood cells (erythrocytes) 4
Leukocytes (white blood cells) 13
Platelets (thrombocytes) 17
Hemostasis and coagulation or clotting of blood 19
Blood group 23
Blood volume 27
Lymph 29
Body fluid pH regulation 30

2. Nerve Muscle Physiology 33

Neuron 33
Nerve fiber or axon 34
Strength duration curve 36
Potentials 37
Nerve injuries 40
Myesthenia gravis—disease of neuro muscular junction 44
Motor nerve fibers and motor units 44
Muscles 44
Skeletal muscles 45
Smooth muscle 49

3. Cardiovacular System 50

Blood vessels 51
Cardiac muscle 51
Properties of the cardiac muscle 51
Conducting system of human heart 53
Cardiac muscle action potential 55
Biophysical aspects of circulation 57
Peripheral resistance 59
Extrinsic control of peripheral blood flow 60
Venous return 62
Electrocardiogram (ECG/EKG) 64
Lead system 64
Cardiac cycle 67
Heart rate and its regulation 71
Cardiac output 74
Cardiac catheterization 79
Blood pressure 79
Regulation of blood pressure 81
Regional circulations 86
Cardiovascular shock 89
Autoregulation of blood flow 92

4. Respiratory System 94

Respiratory tract 94
Intrapleural and intra-alveolar pressure 98
Lung compliance 99
Spirogram 100
Ventilation perfusion ratio 101
Oxygen transport 104
Carbon dioxide transport 107

Regulation of respiration 109
Hypoxia 114
Dyspnea 115
Cyanosis 115
Mountain sickness 115
Acclimatization 115
Decompression sickness/Caisson's disease/ dysbarism 116
Apnea 116
Asphyxia 116
Periodic breathing 116
Artificial respiration 117

5. Digestive System 118

Gastrointestinal tract 118
Salivary secretion 119
Mastication or chewing 124
Deglutition or swallowing 124
Gastric secretion 127
Motor functions of stomach 134
Pancreas 136
Liver and bile secretion 140
Movements of small intestine 143
Ileocecal junction 145
Large intestine 146
Defecation 147

6. Endocrinology 149

Anterior pituitary gland 153
Posterior pituitary hormones 157
Endocrine function of adrenal cortex 161
Adrenal cortex 161
Adrenal androgens 165
Aldosterone 165
Endocrine function of adrenal medulla 167
Thyroid gland 170
Endocrine pancreas 177
Insulin 177
Glucagon 181
Glucose homeostasis 182
Parathyroid gland and calcium and phosphate metabolism 183
Parathyroid glands 184
Calcitonin 188

7. Reproduction 190

Reproductive physiology 190
Sex differentiation and development 190
Male reproductive system 192
Semen 196
Female reproductive system 197
Placenta 202
Growth of population and contraception 204
Lactation 206
Gonadal dysgenesis 208

8. Renal Physiology 211

Structure of kidney 211
Renal blood flow 212
Glomerular filtration rate 214
Effective filtration pressure (EFP) or net filtration pressure 215
Functions of renal tubules 218
Concept of tubular reabsorption and secretion 218
Substances reabsorbed in PCT 219
Reabsorption of substances in DCT 222
Diuresis 223
Concentration of urine 223
Secretion 225
Regulation of pH by kidney 225
Juxtaglomerular apparatus 227
Nerve supply to urinary bladder and urinary tract 228
Micturition 229
Cystometrogram 229
Composition of urine 230
Skin and thermoregulation 232

9. Central Nervous System 235

Receptors 235
Synapse 238
Mechanism of synaptic transmission 239
Properties of synapse 239
Synaptic inhibitions 240
Reflex 241
Spinal cord 243
Pain 246

Pathway for crude touch from peripheral parts of body 251
Motor system overview 251
Muscle tone maintenance and regulation 256
Cerebellum 263
Basal ganglia 267
Reticular formation 269
Vestibular apparatus 271
Cerebrospinal fluid (CSF) 273
Thalamus 275
Hypothalamus 276
Limbic system 280
Electroencephalogram (EEG) 281
Autonomic nervous system 282
Sleep and wakefulness 283
Learning and memory 285
Memory 285
Cerebral cortex 286

10. Special Senses 289

Vision 289
Neurophysiological basis of vision 297
Refractive errors 300
Hearing or audition 301
Theories of hearing 306
Auditory pathway 307
Types of deafness 307
Chemical senses 308
Taste/gustation 308
Pathway for taste 309
Sense of smell (olfaction) 310

Index 313