

Contents

SECTION I: GENERAL PHYSIOLOGY

1. Introduction to Physiology	1
<i>Physiological Processes</i>	1
<i>Outline of Human Physiology</i>	2
2. Internal Environment Homeostasis and Feedback Mechanisms	5
<i>Internal Environment Homeostasis</i>	5
<i>Feedback Mechanisms</i>	7
3. Body Fluid Compartments, Extracellular Fluid and Intracellular Fluid	9
<i>Daily Intake of Water</i>	9
<i>Daily Loss of Body Water</i>	9
<i>Body Fluid Compartments</i>	10
<i>Total Body Water</i>	12
4. Formation of Interstitial Fluid and Lymph	14
<i>Formation of Interstitial Fluid</i>	14
<i>Formation of Lymph</i>	15
5. Cell Membrane and Principles of Biological Transport—Across Cell Membrane	17
<i>Cell Membrane</i>	17
<i>Principles of Biological Transport</i>	19
6. Bioelectricity	24
<i>Membrane Potential at Rest and during Activity</i>	24
<i>Genesis of Resting Membrane Potential (RMP)</i>	25
7. Intercellular Communications and Genetics	30
<i>Chemical Messengers</i>	31
<i>Mechanisms by which Chemical Messengers Act</i>	31
<i>Second Messengers and Mechanism of Actions of Second Messengers</i>	31
<i>Receptor Diseases</i>	32
<i>Molecular Basis of the Genes</i>	32
<i>Alleles</i>	34

SECTION II: HEMATOLOGY

8. Composition and Function of Blood and Plasma Proteins	37
<i>Blood</i>	37
<i>Plasma Proteins</i>	39
9. Erythrocytes, Erythropoiesis, Fate and Functions of RBC	43
<i>Erythrocytes</i>	43
<i>Functions of RBC</i>	45
<i>Erythropoiesis</i>	45

10. Hemoglobin and Anemias	50
<i>Hemoglobin</i>	50
<i>Anemias</i>	54
11. White Blood Corpuscles or Leukocytes	58
<i>White Blood Corpuscles</i>	58
<i>Types of Leukocytes</i>	58
<i>Inhibitory Factors</i>	64
<i>Granulopoiesis</i>	64
12. Immunity	67
<i>Innate Immunity</i>	67
<i>Acquired Immunity</i>	68
<i>Humoral Immunity</i>	69
<i>Cell Mediated Immunity</i>	70
<i>Autoimmunization</i>	75
<i>AIDS</i>	76
13. Platelets (Thrombocytes) and Coagulation	77
<i>Platelets</i>	77
<i>Coagulation</i>	79
<i>Bleeding Disorders</i>	83
14. Blood Group	87
<i>Sites</i>	87
<i>Blood Group Antibodies or Agglutinins</i>	87
<i>Classical ABO Blood Groups</i>	88
<i>Rhesus (Rh) Blood Groups</i>	89
<i>M and N Blood Groups</i>	91

SECTION III: NERVE AND MUSCLE PHYSIOLOGY

15. Structure and Classification of Nerves	93
<i>Dendrites</i>	93
<i>Axon</i>	93
<i>Cell Body or Soma</i>	94
<i>Nerve Fibers</i>	94
16. Effect of Injury to Peripheral Nerves—Degeneration and Regeneration	97
<i>Degenerative Changes in the Nerve Cell Body</i>	97
<i>Degenerative Changes in Nerve Fiber</i>	98
<i>Further Degenerative Changes</i>	98
<i>Regenerative Changes</i>	99
17. Properties of Nerve Fiber	100
<i>Excitability or Irritability</i>	100
<i>Conductivity</i>	101
<i>Antidromic Activity and Orthodromic Conduction</i>	102
<i>Refractory Period</i>	102
<i>Summation</i>	102
<i>Adaptation or Accommodation</i>	102
<i>Infatigability</i>	103
<i>All or None Phenomenon</i>	103

18. Neuromuscular Transmission	104
<i>Electron Microscope Appearance</i>	104
<i>Characteristic Features of Neuromuscular Junction</i>	104
<i>Synthesis and Storage of Acetylcholine</i>	105
<i>Fatigue at Neuromuscular Junction</i>	107
19. Classification of Muscle and Structure of Skeletal Muscle	110
<i>Classification of Muscle</i>	110
<i>Structure of Skeletal Muscle</i>	110
<i>Types of Muscle Fibers</i>	111
20. Mechanism of Contraction	116
<i>Sliding Filament Mechanism</i>	116
<i>Excitation Contraction Coupling</i>	118
21. Characteristics of Muscle Contraction	120
<i>Motor Unit and Its Properties</i>	120
<i>Types of Contraction</i>	121
<i>Energy for Muscle Contraction</i>	124
<i>Oxygen Debt</i>	124
<i>Heat Production in Muscle</i>	125
22. Properties of Skeletal Muscle	126
<i>Excitability and Contractility</i>	126
<i>Conductivity</i>	132
<i>Tonicity</i>	132
<i>Refractory Period</i>	132
23. Physiology of Smooth Muscle	133
<i>Functional Anatomy</i>	133
<i>Mechanical Properties</i>	135
<i>Nerve Supply to Smooth Muscle</i>	136
<i>Excitatory Junctional Potential (EJP)</i>	137
<i>Denervation Hypersensitivity</i>	137
<i>Cause</i>	137

SECTION IV: DIGESTIVE SYSTEM

24. Physiological Anatomy and Innervations of Digestive System	139
<i>General Plan and Activities of Alimentary Canal</i>	139
<i>Mucous Coat</i>	140
<i>Main Functions of Alimentary Canal</i>	143
<i>Functions of Different Sections of Alimentary Canal</i>	143
25. Movements of Digestive System	144
<i>Mastication and Deglutition</i>	144
<i>Movements of Stomach</i>	146
<i>Movements of the Pylorus</i>	146
<i>Cause of Movements</i>	147
<i>Movements of Small Intestine</i>	148
<i>Law of Intestine</i>	148
<i>Movements of Large Intestine</i>	149

26. Salivary and Gastric Secretion	151
<i>Salivary Secretion</i>	151
<i>Gastric Secretion</i>	155
27. Composition of Gastric Secretion and Mechanism of Gastric Acid Secretion	158
<i>Composition of Gastric Juice</i>	158
<i>Mechanism of Gastric Acid Secretion</i>	158
<i>Gastric Function Tests</i>	161
28. Functions of Liver	164
<i>Liver Function Tests</i>	167
29. Secretion of Bile, Pancreatic Juice and Succus Entericus	170
<i>Secretion of Bile</i>	170
<i>Pancreatic Juice</i>	172
<i>Succus Entericus</i>	176
30. Large Intestine and Absorption in GI Tract.....	178
<i>Large Intestine</i>	178
<i>Absorption in GIT</i>	180
31. Nutrition and Balanced Diet	185
<i>Nutrition</i>	185
<i>Balanced Diet</i>	196

SECTION V: RESPIRATORY SYSTEM

32. Physiological Anatomy and Composition of Air.....	197
<i>Respiratory Tract</i>	197
<i>Blood Supply</i>	199
<i>Alveolar Surface Tension</i>	200
<i>Composition of Inspired, Expired and Alveolar Air</i>	200
33. Mechanics of Respiration.....	202
<i>Inspiration and Expiration</i>	202
<i>Intrapleural Pressure (Intrathoracic Pressure)</i>	205
<i>Compliance</i>	206
<i>Surfactant</i>	207
<i>Airway Resistance</i>	208
34. Pulmonary Volumes and Capacities/Pulmonary Function Tests	209
<i>Pulmonary Volumes</i>	209
<i>Pulmonary Capacities</i>	210
<i>Pulmonary Function Tests for Diffusion</i>	216
35. Oxygen Carriage	217
<i>Lungs Diffusion of Oxygen</i>	217
<i>Oxygen Transport in Blood</i>	219
<i>In the Tissues Oxygen Transfer</i>	220
<i>Factors Affecting Oxygen Transfer or Oxygen Dissociation</i>	220
36. Carbon Dioxide Carriage.....	222
<i>Transfer of Carbon Dioxide from Tissues to Blood</i>	222
<i>Carbon Dioxide Transport</i>	222
<i>Dissolved Carbon Dioxide</i>	223

<i>Carbon Dioxide Transport as Bicarbonates</i>	223
<i>Carbon Dioxide Transport as Carbamino Compounds</i>	224
<i>Carbon Dioxide Dissociation Curve</i>	224
<i>Mechanism of Haldane Effect</i>	226
37. Regulation of Respiration	227
<i>Neural Control of Breathing</i>	227
<i>Higher Neural Influences</i>	229
<i>Chemical Regulation of Respiration</i>	231
<i>Peripheral Chemoreceptors</i>	232
38. Hypoxia and Acclimatization to High Altitude	234
<i>Hypoxia</i>	234
<i>Acclimatization</i>	238
39. Abnormal States of Respiration	240
<i>Hyperpnea (Hyperventilation) Increased Breathing</i>	240
<i>Dyspnea</i>	241
<i>Orthopnea</i>	241
<i>Apnea</i>	241
<i>Asphyxia</i>	243
<i>Decompression Sickness (Caisson's Disease, the Bends) or Dysbarism</i>	244
<i>Cyanosis</i>	245
<i>Hypercapnia</i>	246

SECTION VI: CARDIOVASCULAR SYSTEM

40. General Considerations	247
<i>Functions of the Heart</i>	248
<i>Pressure Gradients in Systemic Circulation</i>	248
<i>Resistance to the Flow (R)</i>	249
<i>Pressure at the Input Side of the Heart (P₂)</i>	249
<i>Vis a Fronte</i>	251
<i>Blood Vessels</i>	251
41. Structure and Properties of Heart Muscle	253
<i>Structure of Heart Muscle</i>	253
<i>Properties of Heart Muscle</i>	257
42. Origin and Spread of Cardiac Impulse	259
<i>Cardiac Excitation</i>	259
<i>Action Potential</i>	260
<i>Conduction of Cardiac Impulse</i>	262
43. Cardiac Cycle	263
<i>Duration of Cardiac Cycle or Cardiac Cycle Time</i>	263
<i>Phases of Cardiac Cycle</i>	263
<i>Atrial Events</i>	263
<i>Ventricular Events</i>	264
<i>Fundamental Rule</i>	266
<i>Important Feature of Ventricular Systole</i>	266
<i>Important Feature of Ventricular Diastole</i>	266

44. Pressure Changes in Heart and Blood Vessels During Cardiac Cycle	267
<i>Ventricular Pressure Changes</i>	268
<i>Intra-atrial Pressure Changes</i>	268
<i>Intra-aortic Pressure Changes</i>	269
<i>Jugular Pressure (Pulse) Tracing or Jugular Venous Pressure (JVP) Changes</i>	270
45. Heart Sounds, Pulse, and Radial Pulse Tracing	272
<i>Heart Sounds</i>	272
<i>Pulse</i>	276
<i>Radial Pulse Tracings</i>	277
46. Cardiac Innervation—Heart Rate and Its Regulation	279
<i>Vagus</i>	279
<i>Cardiac Sympathetic Nerves</i>	280
<i>Heart Rate</i>	281
<i>Regulation of Heart Rate</i>	282
<i>Summary of Factors Influencing Heart Rate</i>	286
47. Cardiac Output	288
<i>Cardiac Index</i>	288
<i>Venous Return</i>	289
<i>Force of the Heartbeat</i>	290
<i>Frequency of Heartbeat (Heart Rate)</i>	291
<i>Peripheral Resistance</i>	291
48. Methods of Measuring Cardiac Output and Summary of Factors Influencing Cardiac Output	292
<i>In Animals</i>	292
<i>In Men</i>	293
<i>Measurement of Cardiac Output by Direct Application of Fick Principle</i>	293
<i>Summary of Factors Influencing Cardiac Output</i>	296
49. Physiology of Blood Vessels and Hemodynamics	298
<i>Structural Features of Components of Blood Vessels (Vascular Tree)</i>	298
<i>Vasodilatation</i>	299
<i>Hemodynamics or Dynamics of Flow of Blood</i>	300
<i>Law of Laplace</i>	304
50. Peripheral Resistance	306
<i>Velocity of Blood Flow</i>	306
<i>Viscosity of Blood</i>	306
<i>Elasticity of Blood Vessel</i>	308
<i>Lumen of Blood Vessel</i>	308
<i>Effect of Vessel Length</i>	308
<i>Control of Peripheral Resistance</i>	308
<i>Local Mechanisms</i>	308
<i>Input from the Periphery</i>	310
<i>Input from Higher Centers</i>	312
51. Blood Pressure	313
<i>In Animals</i>	313
<i>In Men</i>	313
<i>Cause of the Sounds</i>	314

<i>Normal Blood Pressure</i>	316
<i>Functional Significance (Importance) of Blood Pressure</i>	316
<i>Physiological Variation of Blood Pressure</i>	316
52. Factors Determining Arterial Pressure and Regulation of Blood Pressure	318
<i>Factors Determining Arterial Pressure</i>	318
<i>Regulation of Arterial Blood Pressure</i>	318
53. Electrocardiogram (ECG)	323
<i>Recording Apparatus</i>	323
<i>Leads</i>	326
<i>Cardiac Vector or Cardiac Axis</i>	328
<i>Heart Block</i>	330
54. Coronary Circulation	334
<i>Anatomy Right and Left Coronary Arteries</i>	334
<i>Cardiac Veins</i>	335
<i>In Animals</i>	337
55. Regional Circulation	342
<i>Cerebral Circulation</i>	342
<i>Blood-brain Barrier</i>	344
<i>Determination of Cerebral Blood Flow</i>	344
56. Pulmonary Circulation	348
<i>Anatomical Considerations</i>	348
<i>Functions of Pulmonary Circulation</i>	350
57. Capillary Circulation	353
<i>Structure of Capillary</i>	353
<i>Regulation of Vasomotion</i>	354
<i>Transcapillary Exchange</i>	354
<i>Diffusion</i>	354
<i>Micropinocytosis</i>	355
<i>Filtration and Reabsorption</i>	355
<i>Edema</i>	357
58. Cutaneous Circulation	358
<i>Physiological Anatomy</i>	358
<i>Regulation of Blood Flow in the Skin</i>	359
<i>Effect of Cold on Skin Circulation</i>	359
<i>Conditions Affecting Skin Blood Flow</i>	360
<i>Vascular Responses of Skin</i>	360
<i>Causes</i>	360
59. Syncope, Cardiogenic Shock, Causes and Effects of Shock on the Body	362
<i>Syncope</i>	362
<i>Cardiogenic Shock</i>	363
<i>Causes and Effects of Shock on Body</i>	363
60. Cardiovascular Adaptations to Various Grades of Exercise	365
<i>Varieties of Exercise</i>	365
<i>Grading of Exercise</i>	366
<i>Cardiovascular Adjustments</i>	366
<i>Renal and Splanchnic Blood Flow</i>	368
<i>Pulmonary Blood Flow</i>	368

<i>Cerebral Blood Flow</i>	368
<i>Effect of Training on Cardiovascular Function</i>	368

SECTION VII: EXCRETORY SYSTEM

61. Physiological Anatomy	371
<i>Kidney</i>	372
<i>Ureters</i>	376
<i>Bladder</i>	377
62. Glomerular Filtration, Tubular Reabsorption and Secretion	378
<i>Glomerular Filtration</i>	378
<i>Tubular Reabsorption and Secretion</i>	380
63. The Proximal Tubule	383
<i>Sodium Reabsorption</i>	383
<i>Glucose Transport (Reabsorption)</i>	385
<i>Amino Acid Transport</i>	385
<i>Reabsorption of Bicarbonates</i>	385
<i>Phosphate Reabsorption</i>	386
<i>Chloride Reabsorption</i>	386
<i>Potassium Reabsorption</i>	387
<i>Water Reabsorption</i>	387
<i>Loop of Henle</i>	388
<i>Distal Tubule</i>	388
64. Concentrating and Diluting Mechanism of the Kidney (Countercurrent Mechanism)	391
<i>Cause of Medullary Osmotic Gradient</i>	392
<i>Maintenance of Medullary Osmolarity Gradient</i>	392
<i>Countercurrent Multiplier of Loop of Henle</i>	393
<i>Mechanism of Excreting Dilute Urine</i>	394
65. Role of Kidney in Acid-base Balance	396
<i>H⁺ Secretion</i>	396
<i>Fate of H⁺ in the Urine</i>	397
66. Micturition	401
<i>Physiological Anatomy of Bladder and Its Nervous Connections</i>	401
<i>Nerve Supply of Bladder and Urethra</i>	402
<i>Functions of Afferent and Efferent Fibers</i>	403
<i>Transport of Urine through Ureters</i>	403
<i>Mechanism of Filling of Bladder</i>	403
67. Renal Function Tests	407
<i>Tests for Renal Structural Integrity</i>	407
<i>Test for Glomerular Functional Integrity</i>	407
<i>Tests for Tubular Functional Integrity</i>	410

SECTION VIII: TEMPERATURE REGULATION

68. Body Temperature and Heat Balance of the Body	411
<i>Body Temperature</i>	411
<i>Heat Balance of the Body</i>	412

<i>Reduction of Heat Loss</i>	414
<i>Heat Loss</i>	414
69. Thermoregulation, Fever and Hypothermia	417
<i>Thermoregulation</i>	417
<i>Fever or Pyrexia</i>	419
<i>Hypothermia</i>	419

SECTION IX: ENDOCRINE SYSTEM

70. General Considerations	421
<i>Methods of Study</i>	422
<i>Hormone Assays</i>	422
<i>Regulation of Secretion of Hormone</i>	423
<i>Modes of Action of Hormone</i>	424
71. Endocrine Functions of Hypothalamus	427
<i>Endocrine Secretion of Hypothalamus</i>	427
<i>Blood Supply</i>	428
72. Pituitary Gland (Hypophysis) and Adenohypophysis (Anterior Pituitary)	431
<i>Pituitary Gland</i>	431
<i>Adenohypophysis (Anterior Pituitary)</i>	432
73. Posterior Pituitary (Neurohypophysis)	440
<i>Storage of Antidiuretic Hormone</i>	440
<i>Functions of Antidiuretic Hormone (Vasopressin)</i>	441
<i>Regulation of ADH Production</i>	441
<i>Diabetes Insipidus</i>	442
<i>Oxytocin</i>	442
74. Thyroid Gland	445
<i>Physiological Anatomy of the Thyroid Gland</i>	446
<i>Formation of Thyroid Hormones</i>	446
<i>Metabolism of Thyroid Hormones</i>	449
<i>Regulation of Thyroid Secretion</i>	449
<i>Hypothalamic Control of TSH</i>	449
75. Functions of Thyroid Hormones and Diseases of Thyroid Gland	451
<i>Functions of Thyroid Hormones</i>	451
<i>Diseases of Thyroid Glands</i>	454
76. Parathyroid Glands and Calcitonin	459
<i>Parathyroid Glands</i>	459
<i>Calcitonin</i>	464
77. Adrenal Glands—Adrenal Cortex	466
<i>Adrenal Cortex</i>	466
<i>Synthesis</i>	467
<i>Regulation of Cortisol Secretion</i>	467
<i>Transport in the Bloodstream</i>	467
<i>Actions of Adrenocortical Hormones</i>	468
78. Mineralocorticoids and Disorders of Adrenocortical Function	472
<i>Mineralocorticoids or Salt Retaining Hormones</i>	472
<i>Disorders of Adrenocortical Function</i>	474

79. Adrenal Medulla	479
<i>Formation of Catecholamines</i>	479
<i>Actions of Catecholamines</i>	481
80. Pancreatic Hormones	486
<i>Pancreatic Functions</i>	486
<i>Metabolic Effects</i>	487
<i>Glucagon</i>	489
<i>Somatostatin</i>	490
<i>Diabetes Mellitus</i>	490

SECTION X: REPRODUCTIVE SYSTEM

81. Female Reproductive Organs and Ovarian Cycle	493
<i>Female Reproductive Organs</i>	493
<i>Ovarian Cycle</i>	494
82. Menstrual Cycle and Its Hormonal Control	498
<i>Different Phases of Menstrual Cycle</i>	498
<i>Mechanism of Menstrual Bleeding</i>	499
<i>Anovular Menstrual Cycle</i>	500
83. Ovarian Function and Female Sex Hormones	501
<i>Ovarian Function</i>	501
<i>Female Sex Hormones</i>	501
84. Physiology of Pregnancy and Maternal Changes during Pregnancy	505
<i>Physiology of Pregnancy</i>	505
<i>Maternal Changes During Pregnancy</i>	508
85. Labor, Lactation and Methods of Family Planning	510
<i>Labor or Parturition or Delivery or Childbirth</i>	510
<i>Labor</i>	511
<i>Lactation</i>	512
<i>Methods of Family Planning</i>	514
86. Male Reproductive System	516
<i>The Accessory Glands</i>	517
<i>Spermatogenesis</i>	518
<i>Sertoli Cells</i>	519
<i>Factors Regulating Spermatogenesis</i>	519
<i>Erection and Ejaculation</i>	520
87. Endocrine Function of Testis	522
<i>Hormones of the Testis</i>	522
<i>Testosterone in Females</i>	524
<i>Bioassay of Androgens</i>	524

SECTION XI: SPECIAL SENSES

88. Vision	527
<i>Path of Light Ray</i>	529
<i>Receptors</i>	529

<i>Tears</i>	531
<i>Optical System of the Eye</i>	531
<i>Reduced Eye</i>	532
89. Accommodation and Optical Defects	534
<i>Accommodation</i>	534
<i>Pupil</i>	536
<i>Path of Light Reflex</i>	536
<i>Optical Defects and Errors of Refraction</i>	537
90. Physiology of Retina	541
<i>Photochemistry of Retina</i>	541
<i>Light and Dark Adaptation</i>	544
<i>Visual Acuity</i>	545
91. Color Vision	547
<i>Chromatic Series</i>	547
<i>Achromatic Series</i>	547
<i>Photochemistry of Color Vision</i>	548
<i>Color Blindness and Anomalies</i>	550
92. The Visual Path	552
<i>Effects of Injury</i>	554
<i>Various Injuries</i>	554
93. Hearing	556
<i>Anatomy</i>	556
<i>Functions of Muscles</i>	557
<i>Function of Ossicles</i>	557
<i>Internal Ear</i>	558
<i>Elementary Physics of Sound</i>	559
<i>Masking</i>	560
94. Physiology of Hearing	561
<i>Functions of External Ear</i>	561
<i>Functions of Tympanic Membrane</i>	561
<i>Function of Middle Ear</i>	561
<i>Physiology of Internal Ear</i>	561
<i>Electrophysiology of Ear</i>	562
<i>Auditory Pathway</i>	565
<i>Deafness</i>	567
95. Taste	569
<i>Significance of Taste</i>	569
<i>Primary Taste Sensations</i>	569
<i>The Path of Taste</i>	572
96. Sense of Smell (Olfaction)	574
<i>Olfactory Mucous Membrane</i>	574
<i>Physiology of Olfaction</i>	576
<i>Olfactory Path or Olfactory Tract</i>	577
<i>Abnormalities of Olfactory Sensation</i>	578

SECTION XII: NERVOUS SYSTEM

97. Nervous System	579
<i>Structural Organization</i>	579
<i>Functional Organization of CNS</i>	581
<i>Motor Organization</i>	582
98. Structure and Functions of Nervous Tissue	583
<i>Cytology of Neurons</i>	583
<i>Physiology of Neuron</i>	584
<i>Synapse</i>	585
99. Synaptic Transmission	586
<i>Sequence of Events during Synaptic Transmission</i>	586
<i>Electrical Events during Neuronal Excitation</i>	587
<i>Properties of Synaptic Transmission</i>	589
100. Reflex Action	591
<i>Reflex Pathway or Arc</i>	591
<i>Properties of Reflex Action</i>	592
<i>Reflexes of the Body</i>	595
101. Sensations Receptors and Pain	597
<i>Classifications of Sensations</i>	597
<i>Pain</i>	600
<i>Kinesthetic Sensation</i>	602
<i>Classification and Properties</i>	604
102. Spinal Cord	606
<i>The Nerve Cells of the Spinal Cord</i>	607
<i>Extent of Spinal Cord</i>	608
103. Ascending or Sensory Tracts	610
<i>Tracts</i>	610
<i>Major Tracts</i>	610
<i>Minor Tracts</i>	614
104. Descending or Motor Tracts	615
<i>Pyramidal Tract</i>	615
<i>Extrapyramidal Tracts</i>	617
<i>Functions</i>	618
105. Upper Motor Neuron Lesion, Lower Motor Neuron Lesion and Internal Capsule	619
<i>Lower Motor Neurons</i>	619
<i>Upper Motor Neurons</i>	619
<i>Effect of Upper Motor Neuron Lesion</i>	619
<i>Internal Capsule</i>	620
106. Lesions of Spinal Cord—Hemisection and Complete Section	622
<i>Hemisection of Spinal Cord</i>	622
<i>Effect of Complete Transverse Section of Spinal Cord</i>	623
<i>Incomplete Transection of Spinal Cord</i>	627
107. Brainstem	628
<i>Medulla Oblongata Functions</i>	628
<i>Pons</i>	629
<i>Midbrain</i>	629

108. Thalamus	634
<i>The Nuclei of Thalamus</i> 636	
<i>Connections of Thalamus</i> 637	
109. Functional Significance of Thalamus	641
<i>Functions of Thalamus</i> 641	
<i>Thalamic Syndrome</i> 643	
110. Cerebellum	645
<i>Cerebellar Cortex</i> 647	
<i>Cerebellar Nuclei</i> 648	
<i>Connections of Cerebellum</i> 648	
111. Functions of Cerebellum	651
<i>Functions of Archicerebellum</i> 651	
<i>Functions of Paleocerebellum Excluding Archicerebellum</i> 651	
<i>Functions of Neocerebellum</i> 652	
<i>Summary of Function of Cerebellum</i> 653	
<i>Result of Lesion and Tests for Cerebellar Lesion</i> 653	
112. Basal Ganglia	655
<i>Corpus Striatum</i> 656	
<i>Function of Basal Ganglia</i> 658	
<i>Clinical Manifestations Associated with Disease of Basal Ganglia</i> 659	
113. Cerebral Hemisphere	662
<i>Subdivisions of Cerebral Hemispheres</i> 662	
<i>Fine Structure of Cerebral Cortex</i> 664	
<i>Functions of Different Layers of Cerebral Cortex</i> 666	
114. Functional Areas of Frontal Lobe	667
<i>Excitomotor Areas</i> 667	
<i>Area 44 and 45 (Broca's Area)</i> 669	
<i>Cortical Localization</i> 669	
<i>Generalized Functions of Excitomotor Cortex</i> 669	
115. Prefrontal Lobe or Orbitofrontal Region	671
<i>Situation</i> 671	
<i>Experimental Studies</i> 673	
<i>Frontal Lobe Syndrome</i> 674	
<i>Functions of Prefrontal Lobe in Summary</i> 674	
116. Parietal, Temporal, Occipital Lobes and Dominant Hemisphere	676
<i>Parietal Lobe</i> 676	
<i>Temporal Lobe</i> 678	
<i>Occipital Lobe</i> 680	
<i>General Interpretative Area or Wernicke's Area</i> 681	
<i>Dominant Hemisphere</i> 682	
117. Conditioned Reflex and Speech	684
<i>Conditioned Reflexes</i> 684	
<i>Speech</i> 686	
<i>Aphasias</i> 687	

118. Cerebrospinal Fluid	689
<i>Choroid Plexuses</i> 690	
<i>Mechanism of Formation and Absorption</i> 690	
<i>Functions of Cerebrospinal Fluid</i> 690	
119. Learning and Memory	693
<i>Sites of Learning</i> 693	
<i>Intercortical Transfer of Learning</i> 694	
<i>Memory</i> 694	
120. The Limbic System	698
<i>Anatomical Considerations</i> 698	
<i>Limbic Functions</i> 699	
121. Hypothalamus and Emotion	705
<i>Hypothalamus</i> 705	
<i>Emotion</i> 710	
122. Reticular Formation and Reticular Activating System	711
<i>Connections</i> 711	
<i>The Main Function</i> 712	
<i>Functions of Reticular Formation</i> 713	
123. Electroencephalogram (EEG)	715
<i>Origin of Brain Waves or Neurophysiological Basis of EEG</i> 716	
<i>EEG in Various Diseases</i> 718	
124. Sleep	721
<i>Basic Theories of Sleep and Wakefulness</i> 724	
<i>Cycle between Sleep and Wakefulness</i> 725	
<i>Physiological Effects of Sleep</i> 725	
125. Muscle Tone	726
<i>Decerebrate Rigidity</i> 730	
126. Posture	732
<i>Postural Reflexes</i> 732	
<i>Static Posture</i> 732	
<i>Righting Reflexes</i> 735	
<i>Dynamic Posture</i> 735	
127. Equilibrium	736
<i>The Vestibular Apparatus (Labyrinth)</i> 736	
<i>Important Difference between Ampullar and Macular Receptors</i> 741	
128. Autonomic Nervous System	742
<i>Functional Anatomy</i> 742	
<i>The Parasympathetic System</i> 745	
<i>Parasympathetic Afferents</i> 747	
<i>Effects of Autonomic Stimulation</i> 748	
<i>Functions of Autonomic Nervous System</i> 749	
<i>Chemical Transmitter in Autonomic Nervous System (ANS)</i> 749	
<i>Receptors</i> 751	
Index	753