

SECTION II NERVE PHYSIOLOGY

CHAPTER 8 Structure and Functions of Neuron 77–83

Introduction 77
 Structure of Neuron 77
 General Functions of Neurons 80
 Types of Neurons 80
 Neuroglia 80
 Neurotrophins 83

CHAPTER 9 Properties of a Nerve Fiber—Axon 84–87

Properties of a Nerve Fiber 84
 Excitability of Nerve During Different Phases of
 Action Potential 87
 Metabolism in the Nerve Fibers 87
 Heat Production 87

Chapter 10 Peripheral Nerve—Classification of Nerve Fibers 88–90

Structure of Peripheral Nerve Fiber 88
 General Features of Nerve Fibers 89
 Properties of Mixed Nerve Fibers 89
 Classification of Nerve Fibers 90

Chapter 11A Nerve Injuries—Degeneration and Regeneration of Peripheral Nerves..... 91–94

Introduction 91
 Types of Nerve Injuries 91
 Degeneration in the Neuron 92
 Nerve Regeneration 92
 Transneuronal Degeneration 94
 Neurogenesis in the Central Nervous System 94
 Nerve Grafts 94
 Complications of Nerve Injuries 94
 Peripheral Neuropathy 94

Chapter 11B Neuromuscular Junction and Neuromuscular Blocking Drugs..... 95–105

Neuromuscular Junction 95
 Mechanism of Transmission at Neuromuscular Junction 96
 Drugs that Influence the Transmission at
 Neuromuscular Junction 97
 Disorders of Neuromuscular Junction 99

Self-Assessment/Review Questions 101–101

Rapid Review Questions and Answers 102–105

SECTION III MUSCLE PHYSIOLOGY

CHAPTER 12 The Skeletal Muscle 109–115

Introduction 109
 Functions of Muscles 109
 Structure of Skeletal Muscle 109
 Muscle Fiber 110
 Sarcotubular System 112
 Types of Muscle Fibers 113
 Motor Unit 114
 Chemistry of Skeletal Muscle 114

CHAPTER 13 Mechanism of Muscular Contraction and Relaxation—Molecular Basis..... 116–121

Introduction 116
 Muscular Contraction 116
 Molecular Basis of Muscular Contraction 117
 Molecular Basis of Muscular Relaxation 118
 Types of Muscular Contractions 118
 Gradation of Muscular Activity Factors that Influence
 Force of Contraction 120
 Recruitment of Motor Units During Muscular Contraction 120
 Rigor Mortis 120
 Heat Rigor 121

CHAPTER 14 Energy Source for Muscular Contraction 122–123

Introduction 122
 O₂ Debt 122
 Heat Production in the Muscle 123

CHAPTER 15 Properties of Skeletal Muscle and Disorders—Electromyography..... 124–131

Properties of Skeletal Muscle 124
 Velocity of Contraction and Load 126
 Length-Tension Relation 126
 Fatigue 127
 Disorders of Muscles 128
 Muscular Dystrophy-Myopathies 129
 Effects of Denervation on Skeletal Muscle 130
 Electromyography 130

CHAPTER 16 Smooth Muscles 132–143

Structure of Smooth Muscle 132
 Mechanism of Contraction and Relaxation 132
 Nerve Supply 133
 Types of Smooth Muscles 134
 Factors that Influence Smooth Muscle 136
 Denervation Hypersensitivity 137
 Cardiac Muscles 137

Self-Assessment/Review Questions 138–139

Rapid Review Questions and Answers 140–143

SECTION IV CENTRAL NERVOUS SYSTEM

CHAPTER 17 Organization of Nervous System 147–153

Introduction 147
 Divisions of Nervous System 147
 Brain 147
 Methods used to Study the Nervous System 149
 Organization of Brain and Spinal Cord 149
 Peripheral Nervous System 152

CHAPTER 18 Synapse 154–162

Introduction 154
 Classification of Synapse 154
 Structure of a Synapse—Axodendritic 155
 Functions of Synapse 156
 Mechanism of Transmission of Impulse at
 Synapse (Excitatory) 156
 Inhibition of the Transmission at Synapse 157

Excitatory Postsynaptic Potential	157	Pain from Viscera and Face	199
Inhibitory Postsynaptic Potential	157	Disorders of Pain	200
Fate of Released Neurotransmitter	158	Management of Pain	200
Synaptic Inhibition	158	CHAPTER 25 Ascending Tracts	202–209
Presynaptic Facilitation	159	Introduction	202
Properties of Synapse	159	Type of Tracts	202
Synaptic Plasticity	161	Dorsal Columns (Tracts of Gracilis and Cuneatus)	202
CHAPTER 19 Chemical Transmission in the Nervous System (Neurotransmitters)	163–168	Spinothalamic Tracts (Anterolateral System)	204
Definitions	163	Trigeminal Pathway	206
Criteria for Neurotransmitter	163	Great Ascending Sensory Pathway	207
Transport, Release and Mechanism of Action	163	Spinocerebellar Tracts—Dorsal and Ventral Spinocerebellar Tracts	207
Inactivation of Neurotransmitter	164	Spinotectal Tract	207
Classification of Neurotransmitters	164	Lissauer's Tract	208
Acetylcholine	164	Spinovestibular Tract	208
Biogenic Amines	165	Comma Tract	208
Amino Acid Neurotransmitters	166	Spinopontine Tract	208
Peptide Neurotransmitters	167	Spinoreticular Tract	208
Purinerbic Neurotransmitters	167	Spino-Olivary Tract	208
Other Neurotransmitters	168	Lemnisci	208
CHAPTER 20 Reflexes	169–175	CHAPTER 26 Thalamus—A Great Relay Station for Sensory and Motor Impulses	210–214
Introduction	169	Thalamus	210
Reflex Arc	169	Classification of Thalamic Nuclei	210
Classification of Reflexes	170	Functions of Thalamus	212
Important Reflexes	171	Disorders of Thalamus	213
Properties of Reflexes	174	CHAPTER 27 Sensory Cortex (Feeling Brain)	215–217
CHAPTER 21 Organization of the Spinal Cord	176–180	Introduction	215
Introduction	176	Somatosensory Area I	215
Spinal Segments and Spinal Roots	176	Somatosensory Area II	216
Internal Structure of the Spinal Cord	177	Posterior Parietal Cortex	217
Arterial Blood Supply	179	Tests for Sensory Function	217
Functions of Spinal Cord	180	CHAPTER 28 Motor Nervous System (Movement Controlling System)—Corticospinal Tract ..	218–224
CHAPTER 22 Sensory Receptors	181–189	Introduction	218
Sensory Nervous System	181	Components and Functions of the Motor System	218
Sensory Receptors	182	Motor Neurons	219
Cutaneous Receptors	182	Motor Cortex	220
Study of Function of a Receptor	187	Disorders of Motor Nervous System	224
Properties of Sensory Receptors	188	CHAPTER 29 Extrapyramidal System (Medial Motor System)	225–228
CHAPTER 23 Sensations	190–193	Introduction	225
Introduction	190	Extrapyramidal Tracts	225
Classification of Sensations	190	General Functions of Extrapyramidal System	227
Coding of Primary Sensations	193	Features of Extrapyramidal Lesion	227
CHAPTER 24 Physiology of Pain	194–201	Pyramidal versus Extrapyramidal Systems	228
Introduction	194	CHAPTER 30 Basal Nuclei	229–236
Types of Pain	194	Introduction	229
Mechanism of Pain Sensation	195	Components of Basal Nuclei	229
Benefits of Pain	195	Connections of Basal Nuclei	230
Modulation of Pain Perception	195		
Pathway for Pain Sensation	197		
Centers for Pain Sensation	198		

XVIII LPR's Fundamentals of Medical Physiology

Functions of Basal Ganglia	232
Disorders of Basal Ganglia	234
CHAPTER 31 Cerebellum	237–246
Introduction	237
Anatomical Divisions of Cerebellum	237
Phylogenetic Divisions	238
Functional Divisions	238
Structure of Cerebellum	239
Connections of Cerebellum	241
Functions of Cerebellum	243
Cerebellar Disorders	245
Tests for Cerebellar Function	246
CHAPTER 32 Motor Control, Stretch Reflex, Muscle Tone, Gait	247–252
Introduction	247
Types of Movements	247
Levels of Motor Control	247
Stretch Reflex	248
Muscle Tone	250
Gait or Walking	251
CHAPTER 33 Vestibular Apparatus	253–259
Introduction	253
Vestibular Apparatus	253
Innervation and Connections of Vestibular Apparatus	257
Functions of Vestibular Apparatus	257
Disorders of Vestibular Apparatus	258
Tests of Vestibular Function	259
CHAPTER 34 Posture and Equilibrium	260–265
Posture	260
Postural Reflexes	260
CHAPTER 35 Experimental and Clinical Conditions of Spinal Lesions	266–275
Hemiplegia	266
Spinal Cord Lesions	267
Paraplegia	271
Tabes Dorsalis	272
Syringomyelia	272
Subacute Combined Degeneration of Spinal Cord	272
Amyotrophic Lateral Sclerosis (Lou-Gehrig's Disease/ALS/Motor Neuron Disease)	273
Effects of Section of Anterior Nerve Roots	273
Effects of Section of Posterior Nerve Roots	273
Upper and Lower Motor Neuron Lesions	274
Disseminated Sclerosis (Multiple Sclerosis)	275
Spinal Muscular Atrophy	275
CHAPTER 36 Hypothalamus	276–282
Introduction	276
Connections of Hypothalamus	277
Functions of Hypothalamus	277
Disorders of Hypothalamic Function	282
CHAPTER 37 Limbic System	283–286
Introduction	283
Components	283
Important Connections	284
Functions of the Limbic System	284
Addiction	285
CHAPTER 38 Reticular Formation	287–290
Introduction	287
Characteristics of Reticular Formation	287
Components of Reticular Formation	287
Connections of Reticular Formation	288
Neurotransmitters of the Reticular Formation	288
Functions of Descending Reticular Formation	289
Functions of Ascending Reticular Activation System	290
CHAPTER 39 Sleep	291–295
Introduction	291
Physiological Changes during Sleep	291
Theories of Sleep	292
Mechanism of Sleep—Nonrapid Eye Movement	293
Genesis of Rapid Eye Movement Sleep	293
Sleep-Wake Cycle	294
Distribution of Nonrapid Eye Movement and Rapid Eye Movement Sleep	294
Sleep Resembling Conditions	295
Sleep Disorders	295
CHAPTER 40 Electroencephalography	296–300
Introduction	296
Normal EEG Pattern	297
Source of EEG	297
Factors that Influence EEG Waves	298
Abnormal EEG	299
Significance of EEG	299
Evoked Cortical Potentials	299
Epilepsy	300
CHAPTER 41 Cerebral Hemisphere	301–304
Introduction	301
Cerebral Hemispheres	301
Structure of Cerebrum	301
Cerebral Cortex	302
White Matter of Cerebrum	303
Internal Capsule	303
CHAPTER 42 Lobes of Cerebrum—Functions and Disorders	305–311
Parietal Lobe	305
Temporal Lobe	307
Occipital Lobe	308
Frontal Lobe	309
Prefrontal Lobe	310

CHAPTER 43 Higher Functions of the Nervous System..... 312–319

- Introduction 312
- Methods of Study 312
- Learning—Conditioned Reflexes 312
- Memory 313
- Drugs that Facilitate Memory 315
- Disorders of Memory 316
- Speech—Language 316
- Expression of Speech 317
- Disorders of Speech 318

CHAPTER 44 Autonomic Nervous System 320–328

- Introduction 320
- Divisions of Autonomic Nervous System 320
- Sympathetic Nervous System 322
- Parasympathetic Nervous System—Craniosacral System 324
- Comparison of Sympathetic Nervous System and Parasympathetic Nervous System 326
- Enteric Nervous System 326
- Central Control of the Autonomic Nervous System 326
- Functions of Autonomic Nervous System 327
- Bedside Tests for Autonomic Nervous System 327
- Features in Autonomic Insufficiency 328

CHAPTER 45 Brain—Extracellular Fluid and Cerebrospinal Fluid 329–333

- Functional Anatomy 329
- Types of Fluids in Brain and Spinal Cord 330

CHAPTER 46 Blood-Brain Barrier, Blood-Cerebrospinal Fluid Barrier and Circumventricular Organs 334–371

- Introduction 334
- Blood-Brain Barrier 334
- Blood-Cerebrospinal Fluid Barrier 335
- Circumventricular Organs 335

Self-Assessment/Review Questions 337–344**Rapid Review Questions and Answers 345–371****SECTION V BLOOD****CHAPTER 47 Composition and Functions of Blood..... 375–377**

- Introduction 375
- Composition of Blood 375
- Functions of Blood 376

CHAPTER 48 Hemopoiesis..... 378–381

- Introduction 378
- Sites of Hemopoiesis 378
- Theories of Hemopoiesis 378
- Main Phases of Hemopoiesis 379
- Regulation of Hemopoiesis 379
- Bone Marrow 380

CHAPTER 49 Erythrocytes..... 382–385

- Introduction 382
- Morphology of Red Blood Cell 382

- Red Blood Cell Count 383
- Variations in Morphology of Red Blood Cells 384
- Functions of Red Blood Cells 384
- Lifespan of Red Blood Cell 385
- Site of Red Blood Cell Destruction 385
- Fragility of Red Blood Cell 385
- Hemolysis 385

CHAPTER 50 Erythropoiesis 386–390

- Definition 386
- Sites of Erythropoiesis 386
- Stages in Red Blood Cell Development 386
- Changes during Maturation 388
- Regulation of Erythropoiesis 388

CHAPTER 51 Hemoglobin and Different Types of Jaundice..... 391–396

- Introduction 391
- Hemoglobin 391
- Fate of Red Blood Cell and Hemoglobin 393
- Jaundice 394
- Jaundice of Newborn—Physiological Jaundice 395
- Van Den Bergh Reaction 396

CHAPTER 52 Iron Metabolism and Anemia 397–401

- Iron Metabolism 397
- Anemia 399

CHAPTER 53 Packed Cell Volume or Hematocrit, Blood Indices and Erythrocyte Sedimentation Rate..... 402–405

- Packed Cell Volume 402
- Blood Indices 403
- Red Cell Distribution Width 403
- Erythrocyte Sedimentation Rate 403

CHAPTER 54 White Blood Corpuscles (Leukocytes) 406–414

- Introduction 406
- Classification 406
- General Features 406
- Leukopoiesis 407
- Variations in Total Leukocytes Count 407
- Granulocytes 408
- Agranulocytes 411
- Leukemia 414

CHAPTER 55 Monocyte (Macrophage System) and Spleen (Reticuloendothelial System)..... 415–417

- Introduction 415
- Origin of Macrophages 415
- Spleen 416

CHAPTER 56 Immunity and Allergy 418–433

- Introduction 418
- Immune System 418
- Humoral Immunity 420
- Antibodies 422
- Cell-Mediated Immunity 424
- Complement System 426

XX LPR's Fundamentals of Medical Physiology

Cytokines 427
Self-Recognition of Cells 428
Immune Disorders 429
Applications 429
Tissue Grafting and Transplantation 430
Hypersensitivity or Allergy 431

CHAPTER 57 Plasma Proteins 434–438

Introduction 434
Origin 434
Separation of Plasma Proteins 435
Functions of Plasma Proteins 436
Plasmapheresis 437
Changes in Plasma Protein Levels 437

CHAPTER 58 Platelets (Thrombocytes) 439–442

Introduction 439
Morphology, Life Span and Fate 439
Thrombopoiesis 439
Structure and Chemistry of Platelets 439
Properties 440
Functions 441
Platelet Disorders 441

CHAPTER 59 Hemostasis 443–448

Introduction 443
Mechanism of Hemostasis 444
Importance of Blood Coagulation 448

CHAPTER 60 Anticoagulants – Hemostatic Agents – Hemostatic Disorders – Tests 449–455

Introduction 449
Classification of Anticoagulants 449
Fibrinolytic System—Clot Lysis 451
Hemostatic Agents in Clinical Practice 451
Hemophilia 453
Tests to Analyze Defects in Blood Clotting and Bleeding 454

CHAPTER 61 Blood Groups and Transfusion 456–462

Introduction 456
Landsteiner Law 456
Classical ABO System 457
Rh Group System 458
MNS System 459
Bombay Blood Group 459
Importance of Blood Groups 459
Blood Transfusion 459

CHAPTER 62 Lymphoid Organs and Lymph 463–467

Lymphatic System 463
Lymphoid Organs 463
Lymph 465
Lymphatic Duct System 465

CHAPTER 63 Blood Volume 468–491

Introduction 468
Physiological Variation 468
Determination 468

Blood Volume Regulation 469
Pathological Variation 470

Self-Assessment/Review Questions 471–476

Rapid Review Questions and Answers 477–491

SECTION VI CARDIOVASCULAR SYSTEM

CHAPTER 64 Functional Anatomy of the Heart 495–501

Introduction 495
General Scheme of Circulation 495
Functions of Cardiovascular System 496
Heart 496
Mechanism of Contraction and Relaxation 501

CHAPTER 65 Properties of Cardiac Muscle 502–506

Introduction 502
Excitability 502
Conductivity 503
Contractility 504
Auto-Rhythmicity 504
Refractory Period 504
Fatiguability 505
Length-Tension Relation 506

CHAPTER 66 Conducting System of the Heart 507–510

Introduction 507
Components of Conducting System 507
Origin of Cardiac Impulse 509
Spread of Cardiac Impulse 509
Disorders of Conducting System 510

CHAPTER 67 Electrocardiogram 511–520

Introduction 511
ECG Leads 511
ECG Paper 513
Normal ECG 513
Clinical Applications of ECG 515
Electrocardiographic Changes in Clinical Conditions 515
His Bundle Electrogram 517
Cardiac Arrhythmias 517

CHAPTER 68 Cardiac Cycles 521–531

Introduction 521
Atrial Cycle 521
Ventricular Cycle 522
Events during Each Cardiac Cycle 524
Pressure Changes during Cardiac Cycle 524
Volume Changes of Ventricle 527
Pressure-Volume Curve 527
Arterial Pulse 527
Jugular Venous Pulse 529
Apical Impulse (Apex Beat) 529
Heart Sounds (Phonocardiogram) 529
Stenosis 531
Incompetence or Insufficiency 531

CHAPTER 69 Cardiac Output	532–539	Disorders of Blood Pressure 579	
Introduction 532		Venous Pressure 581	
Definitions 532			
Distribution 533		CHAPTER 76 Regional Circulations	
Determination 533		(Coronary Circulation)	583–589
Variations in Cardiac Output 535		Introduction 583	
Regulation of Cardiac Output 535		Arterial Supply to the Heart 583	
Frank-Starling Law 538		Venous Drainage of the Heart 584	
Cardiac Function Curves 539		Special Features of Coronary Circulation 584	
Regulation of Cardiac Output 539		Determination of Coronary Blood Flow 584	
CHAPTER 70 Heart Rate, Venous Return and		Determinants of Coronary Blood Flow 585	
Cardiac Reserve	540–544	Regulation of Coronary Blood Flow 586	
Heart Rate 540		Factors that Affect Coronary Blood Flow 588	
Venous Return 543		CHAPTER 77 Regional Circulations	
Cardiac Reserve 544		(Cerebral Blood Flow)	590–593
CHAPTER 71 Regulatory Mechanisms of		Introduction 590	
Heart and Vascular Function	545–555	Arterial Blood Supply to the Brain 590	
Introduction 545		Venous Drainage of the Brain 591	
Local Autoregulatory Mechanisms 545		Nerve Supply of Brain 591	
Systemic Regulatory Mechanisms 547		Determination of Cerebral Blood Flow 591	
Cardiovascular Reflexes 550		Regulation of Cerebral Circulation 591	
Summary of Regulatory Mechanisms of		Regional Blood Flow in Brain 592	
Heart and Vascular Function 555		CHAPTER 78 Regional Circulations	
CHAPTER 72 Vascular System and Hemodynamics	556–562	(Cutaneous Circulation)	594–596
Circulation of Blood in the Vascular System 556		Introduction 594	
General Structure of Blood Vessels 556		Special Features 594	
Functional Classification of Vessels 557		Measurement of Cutaneous Blood Flow 594	
Hemodynamics 557		Regulation of Cutaneous Blood Flow 595	
CHAPTER 73 Capillary Circulation (Microcirculation)	563–566	Response of the Skin to Mechanical Trauma 595	
Introduction 563		CHAPTER 79 Regional Circulations—Fetal Circulation	
Capillaries 563		and Splanchnic Circulation	597–599
Transcapillary Exchange 565		Fetal Circulation 597	
Tissue Fluid 566		Neonatal Circulation and Respiration 598	
CHAPTER 74 Arterial Blood Pressure	567–572	Splanchnic Circulation 599	
Significance of Blood Pressure 567		CHAPTER 80 Cardiac Function Tests	600–601
Definitions 567		Introduction 600	
Recording of Blood Pressure 568		Tests to Assess Heart Functioning 600	
Factors Maintaining Arterial Blood Pressure-Determinants 569		CHAPTER 81 Moderate Hemorrhage	602–605
Physiological Variations 571		Introduction 602	
CHAPTER 75 Regulation of Arterial Blood Pressure	573–582	Compensatory Reactions 602	
Introduction 573		CHAPTER 82 Heart Failure and Shock—	
Short-Term or Rapid-Acting or Neural Regulatory		Effects of Gravity	606–635
Mechanisms 573		Heart Failure 606	
Intermediate Arterial Blood Pressure Regulatory		Circulatory Shock 607	
Mechanisms 576		Effect of Gravity 611	
Long-Term Arterial Blood Pressure Regulatory		Self-Assessment/Review Questions	612–617
Mechanisms or Renal Regulation 577		Rapid Review Questions and Answers	618–635
Hormonal Regulation of Arterial Blood Pressure 578			

VOLUME 2

SECTION VII GASTROINTESTINAL SYSTEM

CHAPTER 83 Functional Anatomy of Gastrointestinal Tract 639–643

- Parts of Human Digestive Canal 639
- Functions of Alimentary Canal 640
- General Structure of Alimentary Canal 640
- Nerve Supply 640
- General Regulatory Mechanisms of Gastrointestinal Tract Secretions 643

CHAPTER 84 Mouth, Esophagus, and Salivary Glands 644–649

- Mouth 644
- Esophagus 644
- Salivary Glands 644
- Saliva Secretion—Saliva 646

CHAPTER 85 Stomach 650–663

- Structure 650
- Gastric Glands 651
- Functions of Stomach 653
- Composition and Functions of Gastric Juice 653
- Methods of Study of Gastric Secretion 655
- Regulation of Gastric Secretion 657
- Gastric Mucosal Barrier 660
- Tests for Gastric Function 661

CHAPTER 86 Pancreas 664–670

- Introduction 664
- Structure of Pancreas 664
- Pancreatic Juice 665
- Tests for Pancreatic Function 669

CHAPTER 87 Liver, Bile and Gallbladder 671–679

- Liver 671
- Bile 673
- Gallbladder 676
- Liver Transplant 678
- Liver Function Tests 678

CHAPTER 88 Small Intestine 680–683

- Functional Anatomy 680
- Succus Entericus—Intestinal Juice 681
- Functions of Small Intestine 683

CHAPTER 89 Large Intestine 684–689

- Functional Anatomy 684
- Functions 685
- Movements of Large Intestine 685
- Diarrhea 688
- Laxatives 689
- Gas in the Gastrointestinal Tract 689
- Rectal Administration of Drugs 689
- Appendix 689

CHAPTER 90 Digestion and Absorption of Foods 690–698

- Introduction 690
- Digestion and Absorption of Carbohydrates 690
- Digestion and Absorption of Proteins 693
- Digestion and Absorption of Fats 694
- Absorption of Vitamins, Water and Electrolytes 697

CHAPTER 91 Gastrointestinal Motility 699–709

- Overview 699
- Mechanisms Influencing Gastrointestinal Tract Motility 699
- Chewing 700
- Deglutition or Swallowing 700
- Gastric Motility 703
- Small Intestine Movements 706
- Ileocecal Valve 708
- Gut-Brain Axis 708

CHAPTER 92 Gastrointestinal Hormones 710–715

- Introduction 710
- Gastrin 711
- Cholecystokinin-Pancreozymin 711
- Secretin 712
- Ghrelin (GH-REL-IN) (Growth Hormone-Releasing-Incretin) 712
- Gastric Inhibitory Polypeptide 712
- Vasoactive Intestinal Polypeptide 712
- Motilin 712
- Chymodinin 714
- P Substance 714
- Bombesin 714
- Somatostatin 714
- Gastrin Releasing Peptide 714
- Neurotensin 714
- Pancreatic Polypeptide 715
- Glucagon-Like Peptide-1 715
- Guanylin 715

Self-Assessment/Review Questions 716–718**Rapid Review Questions and Answers 719–729**

SECTION VIII RESPIRATORY SYSTEM

CHAPTER 93 Functional Anatomy of Respiratory System, Blood Supply and Functions 733–739

- Introduction 733
- Functional Anatomy 733
- Respiratory Parenchyma 735
- Pulmonary Circulation 736
- Pulmonary Capillary Wedge Pressure 738
- Functions of Respiratory System 738

CHAPTER 94 Mechanics of Breathing 740–749

- Introduction—Breathing 740
- Mechanism of Inspiration 740
- Mechanism of Expiration 742
- Types of Breathing 742

Pressure Changes during Breathing 742	Respiration during Sleep 786
Work of Breathing 744	Disorders Associated with the Regulation of Respiration 786
Stability of Alveoli 747	
CHAPTER 95 Ventilation 750–754	CHAPTER 102 Hypoxia 787–790
Introduction 750	Introduction 787
Types of Ventilation 750	Hypoxic Hypoxia 787
Lung Volumes and Capacities 752	Anemic Hypoxia 788
Sampling of Alveolar Air 752	Stagnant Hypoxia (Ischemic Hypoxia) 788
Uniformity of Alveolar Ventilation 752	Histotoxic Hypoxia 788
Perfusion of Lungs 753	Effects of Hypoxia 789
Ventilation-Perfusion Ratio 753	Oxygen Therapy in Different Types of Hypoxia 789
	Toxic Effects of 100% O ₂ Therapy 790
CHAPTER 96 Diffusion of Gases in the Lung and Tissues 755–758	CHAPTER 103 Pathophysiological States 791–798
Diffusion of Gases in the Lungs 755	Asphyxia 791
Diffusion Capacity of Lungs 757	Cyanosis 792
Diffusion of Gases at Tissue Level 757	Periodic Breathing 792
Respiratory Quotient 758	Kussmaul Breathing 793
	Gasping 793
CHAPTER 97 Pulmonary Function Tests 759–765	Abnormal Respiratory Breathing 794
Introduction 759	Pneumothorax 794
Importance of Pulmonary Function Tests 759	Hydrothorax 795
Classification 759	Pleural Effusion 795
	Chylothorax 795
CHAPTER 98 Transport of Oxygen 766–770	Hemothorax 795
Introduction 766	Bronchiectasis 796
Uptake of O ₂ by the Blood in the Lungs 766	Atelectasis 796
Delivery of O ₂ to the Tissue 767	Emphysema 796
Dissociation Curves of HBO ₂ , HbFO ₂ , MYGO ₂ and HBCO 769	Cystic Fibrosis 796
O ₂ Transport during Exercise 770	Apnea 796
	Hyperventilation 796
CHAPTER 99 Transport of Carbon Dioxide 771–774	Breath Holding 796
Introduction 771	Hypoventilation 797
Uptake of CO ₂ by the Blood 771	Hypercapnia (Hypercarbia) 797
Transport of CO ₂ in the Blood 772	Hypocapnia (Hypocarbia) 797
Delivery of CO ₂ to the Lungs 772	Dyspnea 797
CO ₂ Dissociation Curve 773	Orthopnea 797
	Bronchial Asthma 797
CHAPTER 100 Neural Regulatory Mechanism of Respiration 775–780	Carbon Monoxide Poisoning 797
Introduction 775	Idiopathic Pulmonary Fibrosis 798
Neural Regulation of Respiration 775	Effects of Chronic Smoking on Respiratory Efficiency 798
Genesis of Respiratory Rhythm 778	
Factors Affecting Respiratory Center 778	CHAPTER 104 High Altitude Physiology 799–802
	Introduction 799
CHAPTER 101 Chemical Regulatory Mechanism of Respiration 781–786	Low Atmospheric Pressure 799
Introduction 781	Cold and Dry Weather 800
Peripheral Chemoreceptors 781	UV Light Rays and Other Light Rays 800
Central Chemoreceptors 782	Effects of Hypoxia on Body Systems 800
Ventilatory Responses to O ₂ , CO ₂ and H ⁺ Ion 783	Acclimatization to High Altitude 801
Effect of Interaction of Hypoxia (↓PO ₂) and Hypercapnia (↑PCO ₂) on Ventilation 785	Clinical Conditions Associated with High Altitude 801
Regulation of Respiration during Exercise 786	
	CHAPTER 105 Deep Sea Physiology 803–805
	Introduction 803
	Hazards of Deep Sea Diving 803
	Scuba 805

XXIV LPR's Fundamentals of Medical Physiology

Diving Reflex 805

Drowning 805

CHAPTER 106 Artificial Ventilation and Cardiopulmonary Resuscitation..... 806–809

Artificial Ventilation and Cardiopulmonary Resuscitation 806

Cardiopulmonary Arrest 806

Methods of Cardiopulmonary Resuscitation 807

Need of Cardiopulmonary Resuscitation 809

Self-Assessment/Review Questions 810–813

Rapid Review Questions and Answers 814–827

SECTION IX RENAL PHYSIOLOGY

CHAPTER 107 Urinary System—Structure of Kidney 831–836

Introduction 831

Urinary System 831

Functions of Kidney or Nephron 832

Structure of the Kidney 832

Nephron 832

Types of Nephrons 836

CHAPTER 108 Renal Blood Flow 837–839

Arterial Blood Supply 837

Venous Drainage 837

Measurement of Renal Blood Flow 837

Renal Clearance 838

Special Features of Renal Circulation 839

Regulation of Renal Blood Flow 839

CHAPTER 109 Urine Formation— Glomerular Filtration 840–845

Urine Formation 840

Formation of Glomerular Filtrate 841

Determinants of Glomerular Filtration Rate

(Factors That Influence Glomerular Filtration Rate) 841

Regulation of Glomerular Filtration Rate 842

Determination of Glomerular Filtration Rate 842

Regulation of Renal Blood Flow and

Glomerular Filtration Rate 844

CHAPTER 110 Reabsorption of Substances from Filtrate and Secretion..... 846–852

Introduction 846

Methods of Study of Tubular Function 846

Modes of Reabsorption 847

Regulation of Tubular Reabsorption 847

Reabsorption from Proximal Convoluted Tubule 847

Reabsorption from Loop of Henle 849

Reabsorption from Distal Nephron

(Distal Convoluted Tubule and Collecting Duct) 850

Hormones That Influence Reabsorption from Tubules 851

Secretion of Substances Into Urine 852

CHAPTER 111 Acidification of Urine 853–856

Introduction 853

Reabsorption of HCO_3^- 853

Secretion of H^+ Ion 853

Role of Kidney in Acidosis and Alkalosis 856

CHAPTER 112 Concentrating and Diluting Mechanisms of Urine 857–861

Introduction 857

Production of Concentrated Urine 857

Production of Dilute Urine 861

CHAPTER 113 Regulation of Water by Kidney 862–865

Introduction 862

Water Handling by the Kidney 862

Obligatory Type of Absorption 862

Facultative Type of Absorption 863

Factors That Influence H_2O Absorption 864

Diuresis 864

Diuretics 864

CHAPTER 114 Regulation of Electrolytes..... 866–868

Na^+ Regulation 866

Regulation of K^+ 867

Regulation of Chloride 868

CHAPTER 115 Endocrinal Role of Kidneys 869–873

Introduction 869

Renal Erythropoietin 869

Renin-Angiotensin System 870

$1,25\text{-(OH)}_2$ Cholecalciferol (Calciferol) 871

Thrombopoietin 873

Prostaglandins 873

Kallikrein-Bradykinin System 873

Other Hormones 873

CHAPTER 116 Renal Function Tests, Renal Failure, Artificial Kidney 874–878

Renal Function Tests 874

Renal Failure 876

Abnormal Substances of Urine 876

Dialysis 877

Hemodialysis (Artificial Kidney) 877

Kidney Transplant 878

CHAPTER 117 Urinary Tract—Micturition..... 879–884

Functional Anatomy of Urinary Tract 879

Nerve Supply 880

Physiology of Micturition 881

Self-Assessment/Review Questions 885–888

Rapid Review Questions and Answers 889–898

SECTION X SKIN

CHAPTER 118 Structure and Functions of Skin 901–906

Introduction 901

Structure of Skin 901

Nerve Fibers 902

Blood Supply 903

Glands of the Skin 903

Problems of Skin 904
 Functions of Skin 904
 Color of the Skin 905
 Psoriasis 906
 Burns 906
 Sunburn 906
 Skin Graft 906

SECTION XI ENDOCRINE PHYSIOLOGY

CHAPTER 119 General Introduction to Endocrine Glands..... 909–922

Introduction 909
 Nervous System 909
 Chemical System 909
 Endocrines 910
 Hormones 910
 Relation Between Endocrines and Central Nervous System 911
 Regulation of Hormone Secretion 912
 Methods of Study of Endocrines 913
 Hormonal Actions 913
 Hormones used for Therapeutic Purposes 916
 General Functions of Hormones 917
 Basic Causes of Endocrine Disorders 917
 Assay of Hormones 917
 Endocrine Glands 917

CHAPTER 120 Hypothalamus and Pituitary Gland 923–939

Hypothalamus 923
 Importance of Hypothalamic-hypophyseal Portal System 924
 Pituitary Gland (Hypophysis) 925
 Anterior Pituitary Gland (Adenohypophysis) 925
 Hormones 925
 Growth Hormone (Somatotrophic Hormone) 931
 Physiology of Growth 933
 Neurohypophysis (Posterior Pituitary Gland) 933
 Disorders of Pituitary and Hypothalamus 936

CHAPTER 121 Thyroid Gland 940–951

Introduction 940
 Structure 940
 Biosynthesis and Secretion of Thyroid Hormones 941
 Regulation of Thyroid Hormone Secretion 943
 Mechanism of Action at Cellular Level 944
 Actions (Functions) of Thyroid Hormones 944
 Tests for Thyroid Function 947
 Disorders of Thyroid Function 947
 Management of Thyroid Disorders 951

CHAPTER 122 Bone Physiology—Parathyroid Hormone 952–963

Bone Physiology 952
 Functions of Bones 954
 Bone Disorders 954
 Parathyroid Gland 955
 Disorders of Parathyroid Hormone 958

Calcitonin (Thyrocalcitonin) 958
 Calcium and PO_4 Homeostasis 958
 Relation Between Plasma Ca^{+} and PO_4^{3-} 960
 Disorders of Calcium and PO_4^{3-} Homeostasis 962
 Paget's Disease (Osteitis Deformans) 963

CHAPTER 123 Suprarenal Gland and Adrenal Cortex..... 964–974

Introduction 964
 Adrenal Cortex 964
 Glucocorticoids 965
 Mineralocorticoids 970
 Disorders of Adrenal Cortex 971
 Adrenal Cortex Function Tests 974

CHAPTER 124 Adrenal Medulla and General Adaptation Syndrome 975–981

Adrenal Medulla 975
 Biosynthesis of Catecholamines 976
 Regulation of Adrenal Medullary Secretion 979
 Disorders of Catecholamine Secretion 979
 Tests for Sympatheticoadrenal System 980
 Stress and General Adaptation Syndrome 980

CHAPTER 125 Endocrine—Pancreas..... 982–987

Islets of Langerhans 982
 Insulin 983
 Glucagon 986
 Pancreatic Polypeptide 987
 Somatostatin 987
 Amylin 987

CHAPTER 126 Blood Glucose Homeostasis 988–993

Introduction 988
 Blood Sugar Level 988
 Role of Hormones in the Homeostasis of Blood Glucose 989
 Nervous Regulation of Blood Glucose Level 990
 Disorders 990
 Glucose Tolerance Test 993

CHAPTER 127 Other Endocrine Glands—Local Hormones 994–999

Thymus 994
 Pineal Gland 994
 Hormones of the Heart (Natriuretic Peptides) 995
 Hormones of Kidney 996
 Local Hormones 996

Self-Assessment/Review Questions 1000–1003

Rapid Review Questions and Answers 1004–1020

SECTION XII REPRODUCTIVE SYSTEM

CHAPTER 128 Development of Gonads and Puberty.... 1023–1029

Introduction 1023
 Sex Determination 1023
 Human Chromosomes—Karyotyping 1024

XXVI LPR's Fundamentals of Medical Physiology

Development of Gonads 1025	
Onset of Puberty 1027	
CHAPTER 129 Male Reproductive System— Functional Anatomy.....	1030–1033
Organs 1030	
Primary Sex Organ 1030	
Accessory Sex Organs 1032	
Psychological and Psychosocial Changes during Puberty 1033	
CHAPTER 130 Spermatogenesis.....	1034–1037
Introduction 1034	
Stages in the Spermatogenesis 1034	
Spermatozoa 1035	
Regulation of Spermatogenesis 1036	
Semen 1037	
CHAPTER 131 Male and Female Sexual Act	1038–1040
Male Sexual Act 1038	
Female Sexual Act 1039	
Male Sexual Disorders 1039	
Contraception in Male 1040	
CHAPTER 132 Female Reproductive System— Functional Anatomy.....	1041–1044
Introduction 1041	
Female Sex Organs 1041	
Primary Sex Organ 1043	
CHAPTER 133 Oogenesis—Ovarian Cycle	1045–1050
Introduction 1045	
Changes in the Fetal Ovary up to Birth 1045	
Changes from Postnatal to Puberty 1046	
Postpubertal Changes 1046	
Sexual Cycles in Female 1046	
Cyclical Changes in Cervix and Vagina 1049	
CHAPTER 134 Menstrual Cycle (Endometrial Cycle)—Fertilization	1051–1056
Introduction 1051	
Definition 1051	
Phases of Menstrual Cycle 1052	
Hormonal Cycle 1053	
Fertilization 1054	
Implantation of Zygote (Nidation) 1055	
Ectopic Pregnancies 1055	
Perimenopause and Menopause 1056	
CHAPTER 135 Pregnancy and Pregnancy Diagnostic Tests.....	1057–1061
Pregnancy 1057	
Psychological and Psychiatric Disorders during Pregnancy 1059	
Pregnancy Diagnostic Tests 1060	
CHAPTER 136 Parturition and Placenta	1062–1066
Introduction 1062	
Stages of Parturition 1062	
Initiation of Labor 1062	
Mechanism of Parturition 1063	
Placenta 1064	
CHAPTER 137 Lactation.....	1067–1070
Introduction 1067	
Structure of Mammary Gland 1067	
Development of Breast Gland 1067	
Lactation 1068	
Importance of Lactation 1070	
Composition of Milk 1070	
CHAPTER 138 Contraception	1071–1075
Introduction 1071	
Need for Contraception 1071	
Principles in Contraception 1071	
Methods of Contraception 1072	
CHAPTER 139 Sex Hormones	1076–1083
Estrogen 1076	
Progesterone 1079	
Testosterone 1080	
Other Ovarian and Testicular Hormones 1082	
Gonadotropins 1083	
CHAPTER 140 Fetoplacental Unit, Infertility, Cloning of Mammal and Test Tube Baby	1084–1101
Fetoplacental Unit 1084	
Infertility 1084	
Tests to Assess Fertility Status 1085	
Cloning of a Mammal 1085	
Technique of Making a Baby (Test Tube Baby—IVF) 1086	
Self-Assessment/Review Questions	1088–1089
Rapid Review Questions and Answers	1090–1102
SECTION XIII PHYSIOLOGY OF SPECIAL SENSES	
CHAPTER 141 Gustation (Taste).....	1105–1108
Introduction 1105	
Functional Anatomy 1105	
Taste Pathway 1106	
Physiology of Taste Sensation 1106	
Disorders of Taste 1108	
CHAPTER 142 Olfaction (Smell)	1109–1112
Functional Anatomy of Olfactory System 1109	
Smell Pathway 1110	
Tests for Olfaction 1111	
Special Features of Smell Pathway 1111	
Importance of Olfaction 1111	
Physiology of Smell Sensation 1111	
Disorders of Smell 1112	
CHAPTER 143 Audition—External and Middle Ear.....	1113–1116
Audition 1113	
External Ear 1113	
Middle Ear (Tympanic Cavity) 1114	

CHAPTER 144 Inner Ear—Organ of Corti 1117–1121

Inner Ear 1117
Organ of Corti 1118
Mechanism of Activation of Hair Cells 1120
Function of Hair Cells 1120

CHAPTER 145 Auditory Pathway—Electrical Potentials from Cochlea 1122–1125

Auditory Pathway 1122
Electrical Potentials from Cochlea 1124

CHAPTER 146 Physical Properties of Sound—Mechanism of Hearing 1126–1130

Introduction 1126
Characteristics of Sound 1126
Mechanism of Hearing 1127
Masking 1130
Auditory Cortex 1130

CHAPTER 147 Disorders of Hearing—Hearing Tests ... 1131–1134

Introduction 1131
Hypoacusis 1131
Syndromes 1132
Hearing Tests 1132
Treatment of Deafness 1133

CHAPTER 148 Vision—Functional Anatomy of the Eye 1135–1141

Introduction 1135
Functional Anatomy of Eyeball 1135
Lacrimal Apparatus 1140

CHAPTER 149 Pupillary Reflexes—Accommodation ... 1142–1145

Introduction 1142
Light Reflex 1142
Pupillary Dilatation 1143
Accommodation 1143
Abnormal Pupillary Reflexes 1145

CHAPTER 150 Basic Optics and Image-Forming Mechanism—Visual Acuity—Defects ... 1146–1152

Principles of Optics 1146
Types of Lenses 1146
Image Formation by a Convex Lens 1147
Formation of Image on the Retina 1148
Visual Acuity 1148
Defects of Image Formation Mechanism 1149
Optical Aberrations 1152

CHAPTER 151 Retina and Visual Receptors 1153–1157

Retina 1153
Electroretinogram (ERG) 1156
Visual Receptors 1156

CHAPTER 152 Visual Pathway and Field of Vision 1158–1162

Visual Pathway 1158
Visual Centers 1159
Connections of Visual Pathway 1160

Field of Vision 1160
Effect of Lesion on Visual Pathway at Different Levels 1161
Effect of Lesion on Visual Cortical Areas 1162

CHAPTER 153 Mechanism of Visual Processing 1163–1166

Response of Receptors 1163
Response of Bipolar Cells 1164
Response of Horizontal Cells 1164
Response of Amacrine Cells 1164
Lateral Inhibition 1164
Response of Ganglion Cells 1165
Processing at Lateral Geniculate Nucleus 1165
Processing by Visual Cortex 1165
Depth (Distance) Perception (Stereopsis) 1166

CHAPTER 154 Adaptation of the Eye to Dark and Light Environment 1167–1169

Introduction 1167
Dark Adaptation 1167
Light Adaptation 1168
Critical Fusion Frequency 1169

CHAPTER 155 Color Vision 1170–1174

Introduction 1170
Characteristics of Light 1170
Laws of Color Vision 1171
Theories of Color Vision 1171
Physiological Basis of Color Vision 1172
Lateral Geniculate Nucleus 1172
Color Blindness 1172
Tests for Color Vision 1173
Importance of Color Vision 1174

CHAPTER 156 Movements of the Eyeball and Tests for Visual Function 1175–1177

Introduction 1175
Muscles of the Eyeball 1175
Conjugate Eye Movements 1176
Control of Eye Movements 1176
Blind Sight 1177
Cortical Blindness 1177
Tests for Visual Function 1177

Self-Assessment/Review Questions 1178–1181

Rapid Review Questions and Answers 1182–1191

SECTION XIV INTEGRATED PHYSIOLOGY

CHAPTER 1 Regulation of Body Temperature, Adaptation to Hot and Cold Environment, Fever, Hypothermia, Frostbite and Heat Stroke... 1195–1202

Introduction 1195
Normal Body Temperature 1195
Physiological Variations 1196
Heat Balance 1196
Regulation of Body Temperature 1198
Temperature Regulation in the Newborn 1200

XXVIII LPR's Fundamentals of Medical Physiology

CHAPTER 2 Cardiorespiratory Changes during Exercise, Benefits of Regular Exercise and Cardiovascular Changes 1203–1211

- Introduction 1203
- Acute or Immediate Changes 1204
- Long-Term (Training) Effects of Exercise on Cardiovascular System 1207
- Exercise Under Hot and Cold Environment 1207
- Effects of Isometric Exercise on Cardiorespiratory Adjustments 1208
- Respiratory Changes in Muscular Exercise 1208
- Other Changes in the Body 1209
- Benefits of Regular Exercise on the Body (Training) 1210
- Long-Term Benefits of Regular Exercise (Training) on Body Function 1211
- Benefits of Exercise during Pregnancy and Post-Pregnancy 1211

CHAPTER 3 Physiological Consequences of Sedentary Lifestyle, Obesity and Nutrition 1212–1221

- Sedentary Lifestyle 1212
- Obesity 1213
- Fitness 1215
- Management of Obesity 1216
- Obesity—Mental Health Problems 1216
- Six Super Principles for Burning Calories and Maintaining Body Weight 1217
- Nutrition 1217
- Nutrients 1217
- Milk 1220

CHAPTER 4 Physiology of Aging, Free Radicals and Antioxidants 1222–1226

- Introduction 1222
- Theories of Aging 1222
- Common Diseases of Old Age 1224
- Congenital Aging Disorders 1224
- Free Radicals 1225
- Antioxidants 1226

CHAPTER 5 Concept of Brain Death—Implications 1227–1228

- Concept of Brain Death 1227

CHAPTER 6 Physiological Effects of Yoga and Meditation 1229–1235

- Introduction 1229
- Yoga 1229
- Types of Yogic Practices 1229
- Benefits of Yoga Practice 1234
- Yoga in Health and Disease 1235

CHAPTER 7 Fetal and Neonatal Physiology 1236–1240

- Developmental Stages of a Fetus 1236
- Fetal Growth 1236

- Fetal Circulation 1237
- Neonatal Physiology 1237

CHAPTER 8 Physiology of Acid-Base Homeostasis 1241–1245

- Concept of pH and H^+ Concentration 1241
- Henderson-Hasselbalch Equation (1908) 1241
- Blood Buffers 1242
- Source of Acids 1242
- Source of Alkali 1242
- Defence Against Changes in H^+ Ion Concentration 1242
- Disturbances of Acid-Base Status 1243
- Clinical Evaluation of Disturbances in Acid-Base Status—Anion Gap 1245

CHAPTER 9 Regulation of Composition Osmolality and Volume of Body Fluids (ECF) 1246–1250

- Introduction 1246
- Regulation of Composition 1246
- Regulation of Osmolality (Tonicity) of Extracellular Fluid 1247
- Role of Osmoreceptors 1247
- Role of Aldosterone 1248
- Regulation of Body Fluid Volume of Extracellular Fluid 1248
- Disorders of Volume and Osmolality of Body Fluid 1250

CHAPTER 10 Physiology of Growth—Growth Curves ... 1251–1256

- Growth 1251
- Behavioral Development 1254
- Hyperfunction of Anterior Pituitary 1254
- Growth Disorders 1254

CHAPTER 11 Cytological Methods and their Applications in Clinical Care and Research 1257–1260

- Cytological Methods 1257

CHAPTER 12 COVID-19 1261–1262

- Introduction 1261

CHAPTER 13 Acquired Human Immunodeficiency Syndrome 1263–1266

- Acquired Immunodeficiency Syndrome 1263
- Virology of HIV 1264
- Pathogenesis of HIV 1264
- Clinical Course of AIDS 1265
- Diagnosis of AIDS 1266

CHAPTER 14 Cancer 1267–1268

- Introduction 1267
- Types of Cancer 1267
- Causes for Cancerous Growth 1267
- Stages of Cancer 1268
- Symptoms 1268
- Treatment Options 1268

APPENDICES	
APPENDIX I	Clinical Case Scenario 1271–1277
APPENDIX II	Numerical Formulas for Quick Review 1278–1280

APPENDIX III	Physiological Problems and Solutions 1281–1284
<i>INDEX</i>	<i>..... 1285</i>

Competencies

Competency-Based Undergraduate Curriculum for the Indian Medical Graduate

CODE	COMPETENCY	CHAPTER
General Physiology		
PY1.1	Describe the structure and functions of a mammalian cell.	2 and 63 (Vol. 1)
PY1.2	Describe and discuss the principles of homeostasis.	7 (Vol. 1)
PY1.3	Describe intercellular communication.	2 (Vol. 1)
PY1.4	Describe apoptosis – programmed cell death.	3 (Vol. 1)
PY1.5	Describe and discuss transport mechanisms across cell membranes.	4 (Vol. 1)
PY1.6	Describe the fluid compartments of the body, its ionic composition and measurements.	6 (Vol. 1), 9 (Vol. 2–Int. Phy.)
PY1.7	Describe the concept of pH and Buffer systems in the body.	6 (Vol. 1), 9 (Vol. 2–Int. Phy.)
PY1.8	Describe and discuss the molecular basis of resting membrane potential and action potential in excitable tissue.	5 (Vol. 1)
PY1.9	Demonstrate the ability to describe and discuss the methods used to demonstrate the functions of the cells and its products, its communications and their applications in Clinical care and research.	11 (Vol. 2–Int. Phy.)
Hematology		
PY2.1	Describe the composition and functions of blood components.	47 (Vol. 1)
PY2.2	Discuss the origin, forms, variations and functions of plasma proteins.	57 (Vol. 1)
PY2.3	Describe and discuss the synthesis and functions of hemoglobin and explain its breakdown. Describe variants of hemoglobin.	51 (Vol. 1)
PY2.4	Describe RBC formation (erythropoiesis and its regulation) and its functions.	48, 49 and 50 (Vol. 1)
PY2.5	Describe different types of anemias and Jaundice.	52 (Vol. 1)
PY2.6	Describe WBC formation (granulopoiesis) and its regulation.	54 and 55 (Vol. 1)
PY2.7	Describe the formation of platelets, functions and variations.	58 (Vol. 1)
PY2.8	Describe the physiological basis of hemostasis and anticoagulants. Describe bleeding and clotting disorders (Hemophilia, purpura).	59 and 60 (Vol. 1)
PY2.9	Describe different blood groups and discuss the clinical importance of blood grouping, blood banking and transfusion.	61 (Vol. 1)
PY2.10	Define and classify different types of immunity. Describe the development of immunity and its regulation.	56 (Vol. 1)

XXXII LPR's Fundamentals of Medical Physiology

CODE	COMPETENCY	CHAPTER
PY2.11	Estimate Hb, RBC, TLC, RBC indices, DLC, Blood groups, BT/CT.	<i>Topic for Practicals</i>
PY2.12	Describe test for ESR, Osmotic fragility, Hematocrit. Note the findings and interpret the test results, etc.	53 (Vol. 1)
PY2.13	Describe steps for reticulocyte and platelet count.	<i>Topic for Practicals</i>
Nerve and Muscle Physiology		
PY3.1	Describe the structure and functions of a neuron and neuroglia; discuss nerve growth factor and other growth factors/cytokines.	8 (Vol. 1)
PY3.2	Describe the types, functions and properties of nerve fibers.	9 and 10 (Vol. 1)
PY3.3	Describe the degeneration and regeneration in peripheral nerves.	11A (Vol. 1)
PY3.4	Describe the structure of neuromuscular junction and transmission of impulses.	11B (Vol. 1)
PY3.5	Discuss the action of neuromuscular blocking agents.	11B (Vol. 1)
PY3.6	Describe the pathophysiology of Myasthenia gravis.	<i>Topic for Practicals</i>
PY3.7	Describe the different types of muscle fibres and their structure.	12 (Vol. 1)
PY3.8	Describe action potential and its properties in different muscle types (skeletal and smooth).	15 and 16 (Vol. 1)
PY3.9	Describe the molecular basis of muscle contraction in skeletal and in smooth muscles.	13 and 16 (Vol. 1)
PY3.10	Describe the mode of muscle contraction (isometric and isotonic).	13 (Vol. 1)
PY3.11	Explain energy source and muscle metabolism.	14 (Vol. 1)
PY3.12	Explain the gradation of muscular activity.	13 (Vol. 1)
PY3.13	Describe muscular dystrophy: myopathies.	15 (Vol. 1)
PY3.14	Perform Ergography.	<i>Topic for Practicals</i>
PY3.15	Demonstrate effect of mild, moderate and severe exercise and record changes in cardiorespiratory parameters.	<i>Topic for Practicals</i>
PY3.16	Demonstrate Harvard Step test and describe the impact on induced physiologic parameters in a simulated environment.	<i>Topic for Practicals</i>
PY3.17	Describe strength-duration curve.	15 (Vol. 1)
PY3.18	Observe with Computer assisted learning (i) amphibian nerve - muscle experiments (ii) amphibian cardiac experiments.	<i>Topic for Practicals</i>
Gastrointestinal Physiology		
PY4.1	Describe the structure and functions of digestive system.	83 (Vol. 2)
PY4.2	Describe the composition, mechanism of secretion, functions, and regulation of saliva, gastric, pancreatic, intestinal juices and bile secretion.	84, 85, 86, 87 and 88 (Vol. 2)
PY4.3	Describe GIT movements, regulation and functions. Describe defecation reflex. Explain role of dietary fiber.	89 and 91 (Vol. 2)
PY4.4	Describe the physiology of digestion and absorption of nutrients.	90 (Vol. 2)
PY4.5	Describe the source of GIT hormones, their regulation and functions.	92 (Vol. 2)
PY4.6	Describe the Gut-Brain Axis.	91 (Vol. 2)
PY4.7	Describe and discuss the structure and functions of liver and gall bladder.	87 (Vol. 2)
PY4.8	Describe and discuss gastric function tests, pancreatic exocrine function tests and liver function tests.	85, 86 and 87 (Vol. 2)
PY4.9	Discuss the physiology aspects of: peptic ulcer, gastroesophageal reflux disease, vomiting, diarrhea, constipation, adynamic ileus, Hirschsprung's disease.	85, 89 and 91 (Vol. 2)
PY4.10	Demonstrate the correct clinical examination of the abdomen in a normal volunteer or simulated environment.	<i>Topic for Practicals</i>

CODE	COMPETENCY	CHAPTER
Cardiovascular Physiology (CVS)		
PY5.1	Describe the functional anatomy of heart including chambers, sounds, and pacemaker tissue and conducting system.	64 and 68 (Vol. 1)
PY5.2	Describe the properties of cardiac muscle including its morphology, electrical, mechanical and metabolic functions.	65 (Vol. 1)
PY5.3	Discuss the events occurring during the cardiac cycle.	68 (Vol. 1)
PY5.4	Describe generation, conduction of cardiac impulse.	66 (Vol. 1)
PY5.5	Describe the physiology of electrocardiogram (ECG), its applications and the cardiac axis.	67 (Vol. 1)
PY5.6	Describe abnormal ECG, arrhythmias, heart block and myocardial Infarction.	67 (Vol. 1)
PY5.7	Describe and discuss hemodynamics of circulatory system.	72 (Vol. 1)
PY5.8	Describe and discuss local and systemic cardiovascular regulatory mechanisms.	69, 71 (Vol. 1)
PY5.9	Describe the factors affecting heart rate, regulation of cardiac output and blood pressure.	70, 74, 75 (Vol. 1)
PY5.10	Describe and discuss regional circulation including microcirculation, lymphatic circulation, coronary, cerebral, capillary, skin, fetal, pulmonary and splanchnic circulation.	62, 73, 76, 77, 78 and 79 (Vol. 1)
PY5.11	Describe the pathophysiology of shock, syncope and heart failure.	81 and 82 (Vol. 1)
PY5.12	Record blood pressure and pulse at rest and in different grades of exercise and postures in a volunteer or simulated environment.	Topic for Practicals
PY5.13	Record and interpret normal ECG in a volunteer or simulated environment.	Topic for Practicals
PY5.14	Observe cardiovascular autonomic function tests in a volunteer or simulated environment.	Topic for Practicals
PY5.15	Demonstrate the correct clinical examination of the cardiovascular system in a normal volunteer or simulated environment.	Topic for Practicals
PY5.16	Record Arterial pulse tracing using finger plethysmography in a volunteer or simulated environment.	Topic for Practicals
Respiratory Physiology		
PY6.1	Describe the functional anatomy of respiratory tract.	93 (Vol. 2)
PY6.2	Describe the mechanics of normal respiration, pressure changes during ventilation, lung volume and capacities, alveolar surface tension, compliance, airway resistance, ventilation, ventilation-perfusion ratio, diffusion capacity of lungs.	94, 95 and 96 (Vol. 2)
PY6.3	Describe and discuss the transport of respiratory gases: Oxygen and Carbon dioxide.	98 and 99 (Vol. 2)
PY6.4	Describe and discuss the physiology of high altitude and deep sea diving.	104 and 105 (Vol. 2)
PY6.5	Describe and discuss the principles of artificial respiration, oxygen therapy, acclimatization and decompression sickness.	104 and 106 (Vol. 2)
PY6.6	Describe and discuss the pathophysiology of dyspnea, hypoxia, cyanosis asphyxia; drowning, periodic breathing.	102 and 103 (Vol. 2)
PY6.7	Describe and discuss lung function tests and their clinical significance.	97 (Vol. 2)
PY6.8	Demonstrate the correct technique to perform and interpret Spirometry.	Topic for Practicals
PY6.9	Demonstrate the correct clinical examination of the respiratory system in a normal volunteer or simulated environment.	Topic for Practicals
PY6.10	Demonstrate the correct technique to perform measurement of peak expiratory flow rate in a normal volunteer or simulated environment.	Topic for Practicals
Renal Physiology		
PY7.1	Describe structure and function of kidney.	107 and 108 (Vol. 2)
PY7.2	Describe the structure and functions of juxtaglomerular apparatus and role of renin-angiotensin system.	107, 115 (Vol. 2)
PY7.3	Describe the mechanism of urine formation involving processes of filtration, tubular reabsorption and secretion; concentration and diluting mechanism.	109, 110, 111 and 112 (Vol. 2)

XXXIV LPR's Fundamentals of Medical Physiology

CODE	COMPETENCY	CHAPTER
PY7.4	Describe and discuss the significance and implication of Renal clearance.	113, 114 and 8 (Vol. 2–Int. Phy.)
PY7.5	Describe the renal regulation of fluid and electrolytes and acid-base balance.	113, 114, and 8 (Vol. 2–Int. Phy.)
PY7.6	Describe the innervations of urinary bladder, physiology of micturition and its abnormalities.	117 (Vol. 2)
PY7.7	Describe artificial kidney, dialysis and renal transplantation.	116 (Vol. 2)
PY7.8	Describe and discuss renal function tests.	116 (Vol. 2)
PY7.9	Describe cystometry and discuss the normal cystometrogram.	117 (Vol. 2)
Endocrine Physiology		
PY8.1	Describe the physiology of bone and calcium metabolism.	122 (Vol. 2)
PY8.2	Describe the synthesis, secretion, transport, physiological actions, regulation and effect of altered (hypo and hyper) secretion of pituitary gland, thyroid gland, parathyroid gland, adrenal gland, pancreas and hypothalamus.	119, 120, 121, 122, 123, 124 and 125 (Vol. 2)
PY8.3	Describe the physiology of thymus and pineal gland.	127 (Vol. 2)
PY8.4	Describe function tests: Thyroid gland; Adrenal cortex, Adrenal medulla and pancreas.	119, 121 and 126 (Vol. 2)
PY8.5	Describe the metabolic and endocrine consequences of obesity and metabolic syndrome, Stress response. Outline the psychiatry component pertaining to metabolic syndrome.	Topic for Practicals
PY8.6	Describe and differentiate the mechanism of action of steroid, protein and amine hormones.	119 (Vol. 2)
Reproductive Physiology		
PY9.1	Describe and discuss sex determination; sex differentiation and their abnormalities and outline psychiatry and practical implication of sex determination.	128 (Vol. 2)
PY9.2	Describe and discuss puberty: onset, progression, stages; early and delayed puberty and outline adolescent clinical and psychological association.	128 (Vol. 2)
PY9.3	Describe male reproductive system: functions of testis and control of spermatogenesis and factors modifying it and outline its association with psychiatric illness.	129, 130 and 131 (Vol. 2)
PY9.4	Describe female reproductive system: (a) Functions of ovary and its control; (b) Menstrual cycle—hormonal, uterine and ovarian changes.	131, 132, 133 and 134 (Vol. 2)
PY9.5	Describe and discuss the physiological effects of sex hormones.	139 (Vol. 2)
PY9.6	Enumerate the contraceptive methods for male and female. Discuss their advantages and disadvantages.	131 and 138 (Vol. 2)
PY9.7	Describe and discuss the effects of removal of gonads on physiological functions.	Topic for Practicals
PY9.8	Describe and discuss the physiology of pregnancy, parturition and lactation and outline the psychology and psychiatry disorders associated with it.	135, 136 and 137 (Vol. 2)
PY9.9	Interpret a normal semen analysis report including (a) Sperm count, (b) Sperm morphology and (c) Sperm motility, as per WHO guidelines and discuss the results.	Topic for Practicals
PY9.10	Discuss the physiological basis of various pregnancy tests.	135 (Vol. 2)
PY9.11	Discuss the hormonal changes and their effects during perimenopause and menopause.	134 (Vol. 2)
PY9.12	Discuss the common causes of infertility in a couple and role of IVF in managing a case of infertility.	140 (Vol. 2)
Neurophysiology		
PY10.1	Describe and discuss the organization of nervous system.	17 (Vol. 1)
PY10.2	Describe and discuss the functions and properties of synapse, reflex, receptors.	18, 20, and 22 (Vol. 1)
PY10.3	Describe and discuss somatic sensations and sensory tracts.	23, 24, and 25 (Vol. 1)
PY10.4	Describe and discuss motor tracts, mechanism of maintenance of tone, control of body movements, posture and equilibrium and vestibular apparatus.	28, 29, 32, 33 and 34 (Vol. 1)
PY10.5	Describe and discuss structure and functions of reticular activating system, autonomic nervous system (ANS).	38 and 44 (Vol. 1)

CODE	COMPETENCY	CHAPTER
PY10.6	Describe and discuss spinal cord, its functions, lesion and sensory disturbances.	21 and 35 (Vol. 1)
PY10.7	Describe and discuss functions of cerebral cortex, basal ganglia, thalamus, hypothalamus, cerebellum and limbic system and their abnormalities.	26, 27, 30, 31, 36, 37 and 42 (Vol. 1)
PY10.8	Describe and discuss behavioral and EEG characteristics during sleep and mechanism responsible for its production.	39, 40 and 41 (Vol. 1)
PY10.9	Describe and discuss the physiological basis of memory, learning and speech.	43 (Vol. 1)
PY10.10	Describe and discuss chemical transmission in the nervous system. (Outline the psychiatry element).	19 (Vol. 1)
PY10.11	Demonstrate the correct clinical examination of the nervous system: Higher functions, sensory system, motor system, reflexes, cranial nerves in a normal volunteer or simulated environment.	Topic for Practicals
PY10.12	Identify normal EEG forms.	Topic for Practicals
PY10.13	Describe and discuss perception of smell and taste sensation.	141 and 142 (Vol. 2)
PY10.14	Describe and discuss pathophysiology of altered smell and taste sensation.	141 and 142 (Vol. 2)
PY10.15	Describe and discuss functional anatomy of ear and auditory pathways and physiology of hearing.	143, 144, 145 and 146 (Vol. 2)
PY10.16	Describe and discuss pathophysiology of deafness. Describe hearing tests.	147 (Vol. 2)
PY10.17	Describe and discuss functional anatomy of eye, physiology of image formation, physiology of vision including color vision, refractive errors, color blindness, physiology of pupil and light reflex.	148, 149, 150, 151, 153, 154 and 155 (Vol. 2)
PY10.18	Describe and discuss the physiological basis of lesion in visual pathway.	152 (Vol. 2)
PY10.19	Describe and discuss auditory and visual evoke potentials.	147 and 156 (Vol. 2)
PY10.20	Demonstrate (i) Testing of visual acuity, colour and field of vision and (ii) hearing (iii) Testing for smell and (iv) taste sensation in volunteer/simulated environment.	Topic for Practicals
Integrated Physiology		
PY11.1	Describe and discuss mechanism of temperature regulation.	1 (Vol. 2–Int. Phy.)
PY11.2	Describe and discuss adaptation to altered temperature (heat and cold).	1 (Vol. 2–Int. Phy.)
PY11.3	Describe and discuss mechanism of fever, cold injuries and heat stroke.	1 (Vol. 2–Int. Phy.)
PY11.4	Describe and discuss cardiorespiratory and metabolic adjustments during exercise; physical training effects.	2 (Vol. 2–Int. Phy.)
PY11.5	Describe and discuss physiological consequences of sedentary lifestyle.	3 (Vol. 2–Int. Phy.)
PY11.6	Describe physiology of Infancy.	7 (Vol. 2–Int. Phy.)
PY11.7	Describe and discuss physiology of aging; free radicals and antioxidants.	4 (Vol. 2–Int. Phy.)
PY11.8	Discuss and compare cardio-respiratory changes in exercise (isometric and isotonic) with that in the resting state and under different environmental conditions (heat and cold).	2 (Vol. 2–Int. Phy.)
PY11.9	Interpret growth charts (physiology of growth and growth charts).	10 (Vol. 2–Int. Phy.)
PY11.10	Interpret anthropometric assessment of infants.	Topic for Practicals
PY11.11	Discuss the concept, criteria for diagnosis of brain death and its implications.	5 (Vol. 2–Int. Phy.)
PY11.12	Discuss the physiological effects of meditation.	6 (Vol. 2–Int. Phy.)
PY11.13	Obtain history and perform general examination in the volunteer/simulated environment.	13 (Vol. 2–Int. Phy.)
PY11.14	Demonstrate Basic Life Support in a simulated environment.	106 and 10 (Vol. 2–Int. Phy.)
PY11.15	Discuss COVID-19.	12 (Vol. 2–Int. Phy.)
PY11.16	Discuss AIDS - Acquired Human Immunodeficiency Syndrome.	13 (Vol. 2–Int. Phy.)
PY11.17	Describe the causes, types and therapeutic indicators for cancer	14 (Vol. 2–Int. Phy.)

Abbreviations

1,25(OH) ₂ CCF	1,25-dihydroxy cholecalciferol	BMI	Body mass index
2,3-DPG	2,3-diphosphoglycerate	BMR	Basal metabolic rate
5HT	5-hydroxytryptamine	CA	Carbonic anhydrase
ABP	Androgen binding protein	CAC	Cardioacceleratory center
AC	Apneustic center	CAM	Cell adhesion molecules
ACE	Angiotensin converting enzyme	cAMP	Cyclic AMP
ACh	Acetylcholine	Cb	Carotid body
AChE	Acetylcholinesterase	CBG	Corticosteroid binding globulin
ACTH	Adrenocorticotrophic hormone	CCK-PZ	Cholecystokinin pancreozymin
ADH	Antidiuretic hormone	CCM	Counter current mechanism
ADP	Adenosine diphosphate	CFU (E)	Colony forming unit (erythrocytic)
Adre	Adrenaline	CIC	Cardioinhibitory center
AHC	Anterior horn cell	CL	Corpus luteum
ANP	Atrial natriuretic polypeptide	CLIP	Corticotrophin like intermediate lobe peptide
ANS	Autonomic nervous system	CN	Caudate nucleus
AP	Action potential	CO	Cardiac output
APC	Antigen presenting cells	COHb	Carboxyhemoglobin
APUD cells	Amino precursor uptake and decarboxylation	COMT	Catechol-O-methyl transferase
ARAS	Ascending reticular activating system	CP	Creatine phosphate
ARDS	Adult respiratory distress syndrome	CPK (cK)	Creatine phosphokinase
ARP	Absolute refractory period	CRH	Corticotrophin releasing hormone
ARP	Argyll-Robertson pupil	CRO	Cathode ray oscilloscope
ATP	Adenosine triphosphate	CS syndrome	Carotid sinus syndrome
AV block	Atrioventricular block	CS	Conditioned stimulus
AV node	Atrioventricular node	CSF	Cerebrospinal fluid
BAO	Basal acid output	CVC	Cardiovagal center
BBB	Blood brain barrier	DAG	Diacylglycerol
BBB	Bundle branch block	DBP	Diastolic blood pressure
BER	Basal electric rhythm	DC	Diffusion capacity
BFU (E)	Burst forming unit (erythrocytic)	DCN	Dorsal cochlear nucleus

XXXVIII LPR's Fundamentals of Medical Physiology

DCT	Distal convoluted tubule	HBE	His bundle electrogram
DE	Diffusion co-efficient	HbF	Fetal hemoglobin
DHCC	Dihydroxy cholecalciferol	Hb-OD curve	Hemoglobin oxygen dissociation curve
DHEA	Dehydroepiandrosterone	hCG	Human chorionic gonadotropin
DI	Dyspneic index	HDL	High density lipoproteins
DN	Dentate nucleus	HPL	Human placental lactogen
DNA	Deoxyribonucleic acid	HPNS	High pressure nervous syndrome
DNV	Dorsal nucleus of vagus	HR	Heart rate
DOPA	Dihydroxyphenyl alanine	ICF	Intracellular fluid
DRG	Dorsal respiratory group	ICN	Inferior collicular nucleus
EC coupling	Excitation-contraction coupling	IDDM	Insulin dependent diabetes mellitus
ECF	Extracellular fluid	IF	Interferon
ECG (EKG)	Electrocardiogram	IGF	Insulin like growth factor
EDRF	Endothelium derived relaxing factor	IgG	Immunoglobulin G
EDTA	Ethylene diamine tetra acetate	IL	Interleukin
EEG	Electroencephalogram	ILN	Intralaminar nuclei
EGF	Epidermal growth factor	ION	Inferior olivary nucleus
EMF	Electromotive force	IP ₂	Inositol 1,4—biphosphate
EMG	Electromyogram	IP ₃	Inositol 1,4,5—triphosphate
EP	Erythropoietin	IPSP	Inhibitory postsynaptic potential
EP	Evoked potentials	IRF	Inhibitory reticular formation
EPP	End plate potential	J-G apparatus	Juxtaglomerular apparatus
EPSP	Excitatory postsynaptic potential	JVP	Jugular venous pressure
Fab	Antigen binding fragment	LATS	Long acting thyroid stimulator
FEV	Forced expiratory volume	LBBB	Left bundle branch block
FRC	Functional residual capacity	LDL	Low density lipoproteins
FRF	Facilitatory reticular formation	LGN	Lateral geniculate nucleus
FSH	Follicular stimulating hormone	LH	Loop of Henle
FTM	Fractional test meal	LH	Luteinizing hormone
FVC	Forced vital capacity	LMN	Lower motor neuron
G-CSF	Granulocyte colony stimulating factor	LN	Lateral nucleus
GFR	Glomerular filtration rate	LOS	Lower esophageal sphincter
GH	Growth hormone	LPH	Lipotrophin
GHRH	Growth hormone releasing hormone	LSD	Lysergic acid diethylamide
GIP	Gastric inhibitory polypeptide	LTP	Long-term potentiation
GIT	Gastrointestinal tract	LVH	Left ventricular hypertrophy
GLUT-2	Glucose transporter-2	MABP	Mean arterial blood pressure
G-M CSF	Granulocytic monocytic colony stimulating factor	MAO	Monoamine oxidase
GnRH	Gonadotrophin releasing hormone	MCH	Mean corpuscular hemoglobin
GP	Globus pallidus	M-CSF	Monocytic colony stimulating factor
GRP	Gastrin releasing peptide	MCV	Mean corpuscular volume
H-B reflex	Hering-Breuer reflex	MEPP	Miniature end plate potential
HB	Heart block	MGN	Medial geniculate nucleus
HbA	Adult hemoglobin	MIS	Mullerian inhibitory substance
		mm	Micrometer (10 ⁻⁶ m)

MMC	Migrating motor complex	PP	Pulse pressure
MMEFR	Maximum mid expiratory flow rate	PR	Peripheral resistance
mOsm	Milliosmoles	PRH	Prolactin releasing hormone
mRNA	Messenger RNA	PRL	Prolactin
MSH	Melanocyte stimulating hormone	PSbG	Pregnancy specific b-1 glycoprotein
MVV	Maximum voluntary ventilation	PSNS	Parasympathetic nervous system
NA	Noradrenaline	PTH	Parathyroid hormone
NA	Nucleus ambiguus	PTP	Post-tetanic potentiation
NC	Nucleus cuneatus	PTSH	Placental thyroid stimulating hormone
NG	Nucleus gracilis	PVLN	Posteroventrolateral nucleus
NIDDM	Noninsulin dependent diabetes mellitus	PVN	Paraventricular nucleus
NIP	Nucleus interpositus	R form	Relaxed form
NK cells	Natural killer cells	RAIU	Radioactive iodine uptake
NMJ	Neuromuscular junction	RAS	Renin-angiotensin system
NO	Nitric oxide	RBBB	Right bundle branch block
NREM sleep	Nonrapid eye movement sleep	RBC	Red blood corpuscles
NTS	Nucleus tractus solitarius	RBF	Renal blood flow
OC	Optic chiasma	RDS	Respiratory distress syndrome of newborn
ON	Optic nerve	REM sleep	Rapid eye movement sleep
Osm	Osmoles	RES	Reticuloendothelial system
OT	Optic tract	RMP	Resting membrane potential
OVLT	Organum vasculosum of lamina terminalis	RNA	Ribonucleic acid
PaCO ₂	Partial pressure of CO ₂ in alveoli	RP	Receptor potential
PaCO ₂	Partial pressure of CO ₂ in arterial blood	RP	Refractory period
PAG	Periaqueductal grey matter	RQ	Respiratory quotient
PAH	Para-aminohippuric acid	RRP	Relative refractory period
PaO ₂	Partial pressure of O ₂ in alveoli	RT ₃	Reverse T ₃
PaO ₂	Partial pressure of O ₂ in arterial blood	RV	Residual volume
PBI	Protein bound iodine	RVLM	Rostral ventrolateral medulla
PCO ₂	Partial pressure of CO ₂	SA	Sinus arrhythmia
PCT	Proximal convoluted tubule	SA-node	Sino-atrial node
PD	Potential difference	SBP	Systolic blood pressure
PDGF	Platelet derived growth factor	SCC	Semicircular canals
PECO ₂	Partial pressure of CO ₂ in expired air	SCN	Superior collicular nucleus
PEFR	Peak expiratory flow rate	SDA	Specific dynamic action
PEO ₂	Partial pressure of O ₂ in expired air	SGLT-2	Sodium glucose transporter-2
PESP	Post extra systolic potentiation	SGR	Substantia gelatinosa of Rolando
PG	Prostaglandins	SN	Substantia nigra
PGO spikes	Ponto geniculo occipital spikes	SNP	Supranormal period
pH	Negative log of (H ⁺)	SNS	Sympathetic nervous system
Pi	Inorganic phosphate	SON	Superior olivary nucleus
Picogram	Micro microgram (10 ⁻¹² g)	SRS-A	Slow reacting substance-anaphylaxis
PIH	Prolactin inhibitory hormone	SS	Somatosensory area
PL	Phospholipid	SV	Stroke volume
PO ₂	Partial pressure of O ₂		

XL LPR's Fundamentals of Medical Physiology

T ₃	3, 5, 3' tri iodothyronine	UCS	Unconditioned stimulus
T ₄	3, 5, 3' 5' tetra iodothyronine (thyroxine)	UMN	Upper motor neuron
TBA	Thyroxine binding albumin	V/Q	Ventilation-perfusion ratio
TBG	Thyroxine binding globulin	VC	Vital capacity
TBPA	Thyroxine binding prealbumin	VCN	Ventral cochlear nucleus
TBW	Total body water	VD	Dead space
TGF	Transforming growth factor	VIP	Vasoactive intestinal polypeptide
TLC	Total lung capacity	VMC	Vasomotor center
TNF	Tumor necrosis factor	VMN	Ventromedial nucleus
TPO	Thrombopoietin	VN	Vestibular nucleus
TRH	Thyrotropin releasing hormone	VR	Vasa recta
TSH	Thyroid stimulating hormone	VR	Venous return
TV	Tidal volume	VRG	Ventral respiratory group
TVC	Timed vital capacity	WBC	White blood corpuscles