

Contents

Preface	vii
Chapter 1 Renal Functions, Anatomy, and Basic Processes	1
Functions / 2	
Anatomy of the Kidneys and Urinary System / 4	
The Nephron / 5	
Blood Supply to the Nephrons / 12	
Basic Renal Processes / 16	
Chapter 2 Renal Blood Flow and Glomerular Filtration	24
Glomerular Filtration and Renal Blood Flow / 25	
Flow, Resistance, and Pressure in the Kidneys / 25	
Glomerular Filtration / 26	
Autoregulation / 34	
Chapter 3 Clearance	38
Clearance Units / 39	
Plasma Creatinine and Urea Concentrations as Indicators of GFR Changes / 43	
Chapter 4 Basic Transport Mechanisms	47
Crossing the Epithelial Barriers / 47	
Receptor-Mediated Endocytosis and Transcytosis / 53	
Transport Mechanisms in Reabsorption / 55	
Chapter 5 Renal Handling of Organic Substances	63
Active Proximal Reabsorption of Organic Nutrients (eg, Glucose, Amino Acids) / 64	
Proteins and Peptides / 66	
Active Proximal Secretion of Organic Anions / 68	
Active Proximal Secretion of Organic Cations / 70	
pH Dependence of Passive Reabsorption or Secretion / 74	
Urea / 74	
Chapter 6 Basic Renal Processes for Sodium, Chloride, and Water	77
Overview / 78	
Individual Tubular Segments / 84	
Urinary Concentration: The Medullary Osmotic Gradient / 93	

Chapter 7	Control of Sodium and Water Excretion: Regulation of Plasma Volume and Plasma Osmolality and Renal Control of Systemic Blood Pressure	102
	Regulation of Blood Pressure / 104	
	Contribution of the Kidney to the Regulation of Sodium Excretion and Blood Pressure / 110	
	Control of Water Excretion / 131	
Chapter 8	Renal Regulation of Potassium Balance	140
	Regulation of Potassium Between the Intracellular and Extracellular Compartments / 141	
	Renal Potassium Handling / 143	
Chapter 9	Regulation of Hydrogen Ion Balance	155
	Guidelines for Studying Acid-Base Biology / 156	
	Renal Handling of Acids and Bases / 162	
	Renal Excretion of Acid and Base / 165	
	Hydrogen Ion Excretion on Urinary Buffers / 167	
	Phosphate and Organic Acids as Buffers / 169	
	Hydrogen Ion Excretion on Ammonium / 170	
	Quantification of Renal Acid-Base Excretion / 174	
	Regulation of the Renal Handling of Acids and Bases / 176	
	Control of Renal Glutamine Metabolism and NH_4^+ Excretion / 177	
	Intravenous Solutions: Lactated Ringer's / 178	
	Specific Categories of Acid-Base Disorders / 179	
	Renal Response to Metabolic Acidosis and Alkalosis / 180	
	Factors Causing the Kidneys to Generate or Maintain A Metabolic Alkalosis / 181	
Chapter 10	Regulation of Calcium and Phosphate Balance	185
	Effector Sites for Calcium Balance / 188	
	Hormonal Control of Effector Sites / 192	
	PTH / 193	
	Overview of Renal Phosphate Handling / 197	
	Answers to Study Questions	201
	Appendix A	209
	Appendix B	211
	Index	213