

Contents

Preface to the Third Edition	ix
1. Physical Principles	1
Dalton's Law	1
Boyle's Law	5
Henry's Law and Graham's Law	6
Charles' Law	7
Avogadro's Law	8
Temperature	9
Hagen-Poiseuille Law	9
Laminar Flow	12
Turbulent Flow	12
Time and Pressure	16
2. Anatomy	17
The Airways	17
The Pharynx	19
The Nasopharynx	19
The Oropharynx	19
The Laryngopharynx	20
The Trachea	20
The Pleural Cavities	21
Thoracic Cavity	23
The Rib Cage	25
The Lungs	25
The Bronchopulmonary Segments	30
The Respiratory Unit	30
The Heart	34
The Cardiac Cycle	35
Structure of the Heart	38
The ECG	40
3. Physiology	41
Respiration	41
Ventilation	42

Respiratory Motion	43
Lung Volumes and Capacities	50
Flow rates	53
Pressure Changes in Lungs and Thorax	54
Relationship Between Pressure and Volume	54
Gas Exchange Between Atmosphere, Lungs, and Blood	55
Surface Tension	55
Compliance	56
Resistance to Ventilation	57
Blood Gases	58
Oxygen Transport	58
Carbon Dioxide Transport	62
Hydrogen Ion (H^+) Concentration (pH)	67
Acid-Base Balance: Definitions	68
Normal Acid-Base Values	73
4. Pathology	74
Pulmonary Pathophysiology	74
Symbols	74
Ventilation-Perfusion Ratio	75
The Normal Lung	75
Effect of Positioning on \dot{V}_A/\dot{Q} Ratio	79
Acid-Base and Blood Gas Abnormalities	80
Hydrogen Ion Concentration (pH)	81
Alkalosis	83
Acidosis	84
Normal Acid-Base Values	84
Acid-Base Disorders	86
Mixed Disturbances	87
Cyanosis	88
Disease Barriers	88
Pink Puffers and Blue Bloaters	96
Infectious Diseases of the Lungs	99
Tuberculosis	101
Fungal Diseases	102
Pulmonary Viral Diseases	103
Lung Abscess	103
Parasitic Diseases	104
Allergic Disorders	104
Hamman-Rich Syndrome (Diffuse Interstitial Pulmonary Fibrosis)	106
DIP (Desquamative Interstitial Pneumonitis)	106

Pulmonary Hemosiderosis	107
Carcinoma of the Lung (Lung Cancer)	107
Atelectasis	108
Pneumothorax	109
Occupational Lung Diseases	110
Prescribing Respiratory Therapy	113
Surgical Patients	114
5. Medical Gas Therapy	116
High-Pressure Regulators	116
Gases and Cylinders	121
Standard Safety Systems	127
6. Aerosol Humidity and Oxygen Therapy	132
Humidifiers	132
Nebulizers	137
Ultrasonic Aerosol	140
Oxygen Masks	141
Aerosol Mask	146
Precautions in the Use of Masks	147
Tents, Croupettes, and Incubators	148
Nasal Oxygen	149
7. Positive-Pressure Breathing Therapy	151
Intermittent Positive-Pressure Breathing (IPPB)	151
Volume-Limited	153
Pressure-Limited	153
Indications for Mechanical Ventilation	162
Etiology of Hypoxia (Decreased O ₂)	164
Etiology of Hypercapnia (Increased CO ₂)	164
Contraindications to IPPB	164
Monitoring	165
Definitions	166
IPPV, NEEP, PEEP, NPV, CPPV, HFPPV	166
Setting Up a Ventilator	173
Pressure	174
Pressure Curves	175
Flow Curves	177
Uniform Definitions for Breathing Machines	183
Harmful Effects of Positive-Pressure Breathing (PPV)	186
Monitoring Procedures	189
Blood Gas Electrode Calibration	193
Transcutaneous Gas Analysis (TCGA)	194

Mass Spectrometry	195
8. Airway Management	197
Airway Care	197
Tracheostomy Problems	198
Cleaning and Sterilization Techniques	203
9. Postural Drainage, Chest Physiotherapy, and Breathing Exercises	207
Postural Drainage	207
Postural Drainage in Children	223
Match Test and Candle Exercise	224
Diaphragmatic Breathing	224
Sitting Exercise	229
Head-Down Position for Bronchial Drainage	229
Gordon-Barach Emphysema Belt	229
The Hill Apparatus	231
Clapping and Vibration	233
Incentive Spirometry	233
10. Pharmacology	235
DESI	236
Aerosol Drugs	238
The Adrenergic Drugs	239
Mucolytic Agents	244
Antibiotics	246
Oxygen	246
Appendix A	249
Appendix B	252
Index	259