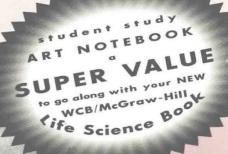
# ART NOTEBOOK



HOLE'S

### HUMAN ANATOMY SZPHYSIOLOGY

DAVID SHIER

JACKIE BUTLER

RICKI LEWIS



SEVENTH EDITION



#### HOLE'S

## HUMAN ANATOMY EPHYSIOLOGY

#### DAVID SHIER

WASHTENAW COMMUNITY COLLEGE

#### JACKIE BUTLER

GRAYSON COUNTY COMMUNITY COLLEGE

#### RICKI LEWIS

THE UNIVERSITY AT ALBANY



#### WCB/McGraw-Hill

A Division of The McGraw-Hill Companies

#### SSAN t/a HUMAN ANATOMY & PHYSIOLOGY

Copyright © 1996, by The McGraw-Hill Companies, Inc. All rights reserved. printed in the United States of America. Except as permitted under the United States Copyright Act of 1976, no part of this publication may be reproduced or distributed in any form or by any means, or stored in a data base or retrieval system, without the prior written permission of the publisher.

4 5 6 7 8 9 0 QPD/QPD 9 0 9 8 7

ISBN 0-697-25381-3

Cover Photo credit: @ Mark Lewis/Tony Stone Images

The credits section for this book begins on page 237 and is considered an extension of the copyright page.

http://www.mhhe.com

#### TO THE INSTRUCTORS AND STUDENTS

This Student Study Art Notebook is a gratis ancillary to assist students in note taking during lectures. On each page, there are one, two, or sometimes three figures faithfully reproduced from the textbook. Each figure also corresponds to one of the 300+ acetates available to instructors who adopt this textbook.

The intention is to place the acetate art in front of students (via the notebook) as the instructor uses the

overhead during lectures. The advantage to the student is that he/she will be able to see all labels clearly, and take meaningful notes without having to make hurried sketches of the acetate figure.

The pages of the Art Notebook are perforated and three-hole punched, so they can be removed and placed in a personal binder for specific study and review, or to create space for additional notes.

#### DIRECTORY OF NOTEBOOK FIGURES

#### TO ACCOMPANY

SHIER ET AL., HOLE'S HUMAN ANATOMY AND PHYSIOLOGY, 7E.

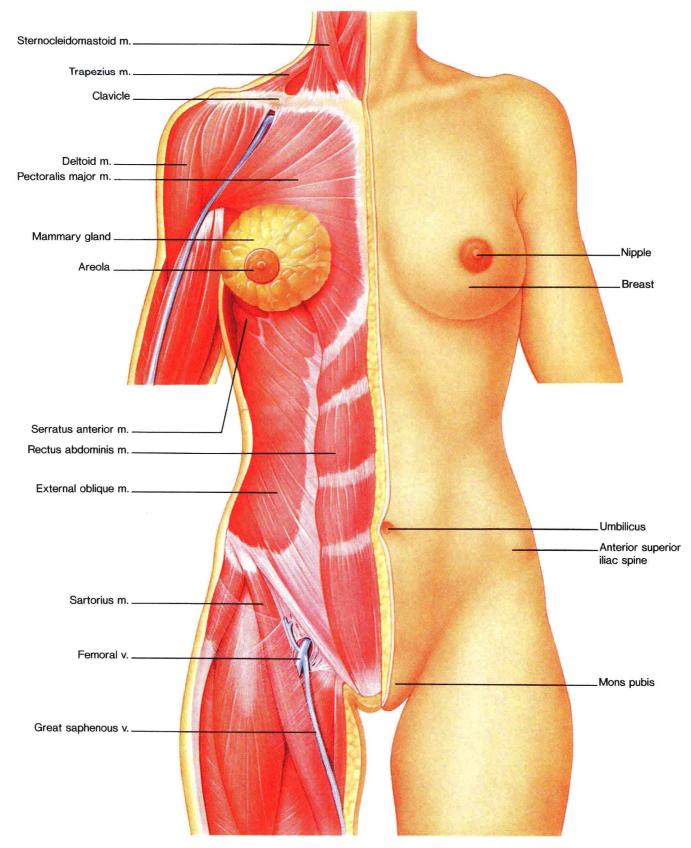
Human Torso, Anterior Surface and	-	Astina Transport Figure 3.24	10
Superficial Muscles Reference Plate 1	1	Active Transport Figure 3.28	19
Human Torso, Deeper Muscle Layers	2	Phagocytosis Figure 3.30	19
Reference Plate 2	2	Mitosis Figure 3.35	20 21
Human Torso, Abdominal Viscera	2	Cellular Differentiation Figure 3.42	21
Reference Plate 3	3	Chantan A	
Human Torso, Thoracic Viscera	4	Chapter 4	
Reference Plate 4	4	Dehydration Synthesis Forms Disaccharide	22
Human Torso, Lungs, Heart, and Small	5	Figure 4.1	22
Intestine Sectioned Reference Plate 5	5	Dehydration Synthesis Forms Fat	22
Human Torso, Heart, Stomach, and Part of		Figure 4.2	22
Intestine and Lungs Removed	6	Dehydration Synthesis/Peptide Bond	23
Reference Plate 6	0	Figure 4.3	23
Human Torso, Visceral Organs Removed Reference Plate 7	7	Enzyme-Substrate Interaction Figure 4.5	24
neierence Flate /	,	Cellular Metabolism Figure 4.6 ATP Figure 4.7	25
Chanter 1			26
Chapter 1 Homoostatic Machanism, Figure 1.5	8	Glycolysis Figure 4.10 Citric Acid Cycle Figure 4.11	27
Homeostatic Mechanism Figure 1.5 Hierachy of Organization Figure 1.6	8	Breakdown of Proteins, Carbohydrates,	21
Major Body Cavities Figure 1.7	9	and Fats Figure 4.16	28
Body Planes Figure 1.17	10	Base-Pairing of DNA Bases Figure 4.21	29
body Flanes Figure 1.17	10	Portion of a DNA Double Helix Figure 4.22	30
Chapter 2		RNA Bases Figure 4 23	31
Organization of an Atom Figure 2.2	10	DNA-RNA Transcription Figure 4.25	31
Ionic Bond Figure 2.3	11	Protein Synthesis Figure 4.26	32
Covalent Bond Figure 2.4	11	DNA Replication Figure 4.28	33
pH of Common Substances Figure 2.8	12	Brazilion Figure 4.20	00
Structure of Glucose Figure 2.9	12	Chapter 5	
General Structure of a Steroid Figure 2.14	13	Exocrine Glands Figure 5.10	34
Structure of an Amino Acid Figure 2.15	13	Merocrine Glands Figure 5.11	35
Secondary Structure of a Protein		Moreonine charles Tigure 5.11	-
Figure 2.17	14	Chapter 6	
Tertiary Structure of a Protein Figure 2.18	14	Skin Section Figure 6.2	36
remary enderers of all reterm rights are		Layers of the Epidermis Figure 6.3	37
Chapter 3		A Melanocyte Figure 6.5b	38
Composite Cell Figure 3.3	15	Body Temperature Regulation Figure 6.12	39
Cell Membrane Figure 3.7	16	Skin Regeneration Figure 6.14	40
Secretory Processes of a Cell Figure 3.12	17	Integumentary System InnerConnections:	
Facilitated Diffusion Figure 3.23	18	Chapter 6	41

Chapter 7 Structure of a Long Bone Figure 7.2 Compact Bone Figure 7.5 Cartilaginous Cells Figure 7.9a Traumatic Fractures Box 7.3, Figure 7A Repair of a Fracture Box 7.3, Figure 7B Upper Limb Figure 7.14 Hormonal Regulation of Bone Calcium	42 43 44 45 46 47	Neuromuscular Junction Figure 9.7 Sliding Filament Theory Figure 9.10 Contraction of a Sarcomere Figure 9.11 Muscle Metabolism Figure 9.13 Muscle Fiber Contraction Figure 9.16 Origin and Insertion Figure 9.19 Skeletal Muscles, Anterior Figure 9.20 Skeletal Muscles, Posterior Figure 9.21 Muscles of Expression and Mastication	75 76 77 78 78 79 80 81
Figure 7.15 Human Skeleton, Anterior & Posterior		Muscles of Expression and Mastication Figure 9.22	82
Figure 7.17 Human Skull, Anterior Figure 7.19 Human Skull, Lateral View Figure 7.21 Human Skull, Inferior Figure 7.22	49 50 51 52	Muscles of Posterior Neck and Trunk Figure 9.23 Muscles of Posterior Shoulder Figure 9.24 Muscles of the Anterior Chest and	83 84
Human Skull, Cranial Floor Figure 7.26	53	Abdominal Wall Figure 9.25	85
Human Skull, Sagittal Figure 7.29 Human Skull, Posterior Figure 7.30	54 55	Muscles of the Scapula and Upper Arm Figure 9.26	86
Mandible Figure 7.31 Infantile Skull Figure 7.33 Vertebral Column Figure 7.34	55 56 57	Muscles of the Anterior Shoulder and Upper Arm Figure 9.28 Muscles of the Anterior Forearm	87
Types of Vertebrae Figure 7.35	58	Figure 9.29	88
Atlas and Axis Figure 7.36 Thoracic Cage Figure 7.40a Pectoral Girdle Figure 7.42a Bones of the Upper Limb Figure 7.44a-c The Pelvic Girdle Figure 7.49a,b	58 59 60 61 62	Muscles of the Posterior Forearm Figure 9.30 Muscles of the Pelvic Outlet Figure 9.33 Muscles of the Anterior Thigh Figure 9.34 Muscles of the Lateral Thigh Figure 9.35	89 90 91 92 93
Left Coxal Bone Figure 7.50 Female Pelvis Figure 7.51 Lower Right Limb Figure 7.52b,c,d	62 63 64	Muscles of the Posterior Thigh Figure 9.36 Muscles of the Anterior Lower Leg Figure 9.38 Muscles of the Leteral Lower Leg	94
Skeletal System InnerConnections: Chapter 7	65	Muscles of the Lateral Lower Leg Figure 9.39	95
<b>Chapter 8</b> Synovial Joint Figure 8.7	66	Muscles of the Posterior Lower Leg Figure 9.40 Muscular System InnerConnections:	96
Femur and Tibia Figure 8.8 Movable Joints Figure 8.9a-c Movable Joints Figure 8.9d-f	66 67 68	Chapter 9 Chapter 10	97
Shoulder Joint Figure 8.13a Surfaces of the Shoulder Figure 8.14 Elbow Joint Figure 8.15a Collateral Ligament Figure 8.16	69 69 70 70 71	Motor and Sensory Neuron Figure 10.3 Schwann Cell Figure 10.4 Types of Neurons Figure 10.6 Neuroglial Cells Figure 10.7 Establishment of the Resting Potential	98 99 100 101
Hip Joint Figure 8.18a Right Hip Joint Figure 8.19 Knee Joint Figure 8.20a Ligaments within the Knee Joint	71 72	Figure 10.11 The Action Potential Figures 10.12 Synaptic Knob and Synaptic Cleft	102 103
Figure 8.21  Chapter 9	73	Figure 10.17 Reflex Arc Figure 10.21 Knee-Jerk Reflex Figure 10.22	104 105 106
Skeletal Muscle Structure Figure 9.2 Skeletal Muscle Fiber I Figure 9.3 Skeletal Muscle Fiber II Figure 9.6	74 74 75	Withdrawal Reflex Figure 10.23 Nervous System InnerConnections: Chapter 10	106 107

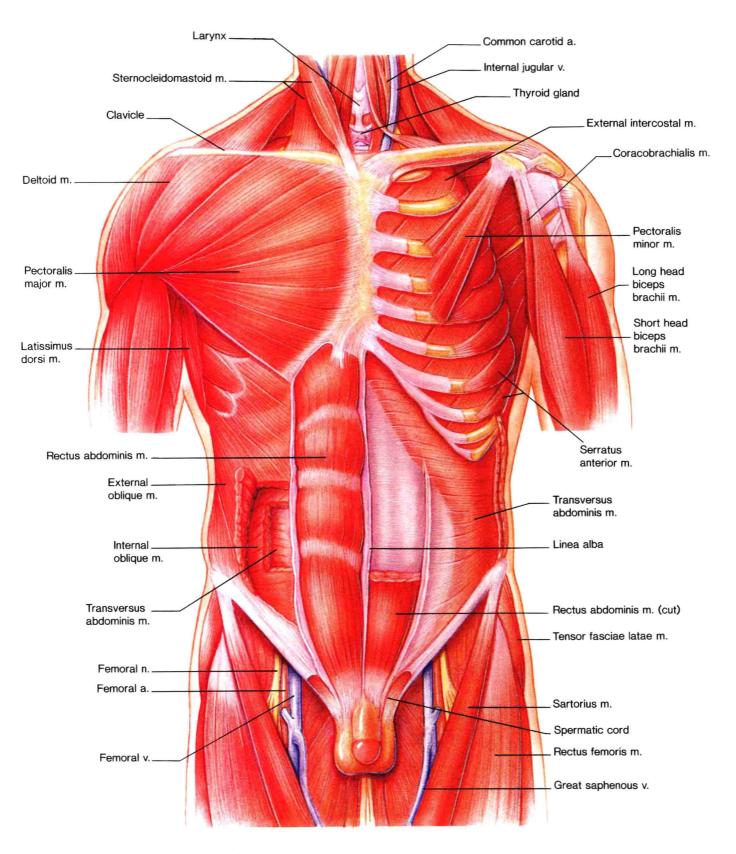
Chapter 11 Meninges I Figure 11.1 Meninges II Figure 11.2 Ascending Tracts Figure 11.6 Descending Tracts Figure 11.7 The Brain Figure 11.9 Sensory, Motor, and Association Areas Figure 11.11 Motor and Sensory Areas Figure 11.12 Ventricles of the Brain Figure 11.14 Cerebrospinal Fluid Circulation Figure 11.15 A Mixed Nerve Figure 11.20 Cranial Nerves Figure 11.22 Spinal Nerves Figure 11.26 Intercostal Nerves Figure 11.29 Somatic and Autonomic Nerve Pathways	108 109 110 111 111 112 113 114 115 116 117 118	Parathyroid Hormone Figure 13.25 Control of Blood Glucose Figure 13.34  Chapter 14 Blood Figure 14.1 Blood Cell Development Figure 14.3a Low Oxygen Pressure Figure 14.6 Red Blood Cells Figure 14.7 Leukocytes Figure 14.15 Platelet Plug Formation Figure 14.17 Hemostasis Figure 14.18 Intrinsic Blood Clotting Mechanism Figure 14.20 ABO Blood Types Figure 14.22 ABO Blood Reactions Figure 14.23 Rh+ Factor Figure 14.24	137 138 139 140 141 142 142 143 144 145 145
Figure 11.32 Sympathetic Fibers in Spinal Nerves Figure 11.34 Sympathetic Nervous System Figure 11.35 Parasympathetic Nervous System Figure 11.36  Chapter 12	119 120 121 122	Chapter 15 The Heart Figure 15.4 Heart, Frontal Section I Figure 15.6a Heart, Frontal Section II Figure 15.6b The Right Ventricle Figure 15.10 Path of Blood through the Heart Figure 15.11 Heart and Coronary Vessels, Anterior Figure 15.12a	147 148 148 149 150
Referred Pain-Pathway Figure 12.4 Olfactory Receptors Figure 12.6 Taste Receptors Figure 12.8 Structure of the Ear Figure 12.11 Inner Ear Structure Figure 12.13 Organ of Corti Figure 12.15 Static Equilibrium Figure 12.20 Dynamic Equilibrium Figure 12.23 Extrinsic Muscles of the Eye Figure 12.26 Eye, Transverse Section Figure 12.27 Lens and Ciliary Body Figure 12.31 Retina Figure 12.34	123 124 125 125 126 127 128 128 129 130	Heart and Coronary Vessels, Posterior Figure 15.12b Coronary Arteries and Cardiac Veins Figure 15.13 Atrial Systole and Diastole Figure 15.16 Cardiac Cycle Figure 15.17 Cardiac Conduction System Figure 15.19 Cardiac Conduction System Components Figure 15.20 Heart Rate Control Figure 15.22 Wall of an Artery and a Vein Figure 15.23 Depolarization and Repolarization Box 15.2, Figure 15D	152 153 153 154 154 155 155 156
Chapter 13 Major Endocrine Glands Figure 13.2 Steroid Hormone Action Figure 13.4 Nonsteroid Hormone Action Figure 13.6 Negative Feedback System Figure 13.7 Pituitary Gland Figure 13.10 Hypothalamic Control of Hormone Secretion Figure 13.11 Hormones from the Hypothalamus and Anterior Pituitary Figure 13.13 Control of Thyroid Hormone Secretion Figure 13.14	132 133 134 134 135 135 135	Metarterioles Figure 15.26 Capillary Exchanges Figure 15.29 Arterial Pulse Sites Figure 15.33 Arterial Blood Pressure Figure 15.34 Inhibiting the S-A Node Figure 15.37 Dilating Arterioles Figure 15.38 The Pulmonary Circuit Figure 15.40 Cells of the Alveolar Wall Figure 15.42 The Brain Figure 15.47 Arterial System Figure 15.52 Circulatory System Figure 15.57 Venous System Figure 15.59	157 157 158 158 159 160 161 161 162 163 164

Cardiovascular System InnerConnections: Chapter 15	165	Figure 19.14 Intra-Alveolar Pressure Changes Figure 19.22	194 195
Chapter 16 Lymphatic Vessels Figure 16.1 Lymph Capillaries Figure 16.2 Lymph Drainage Figure 16.4 The Lymphatic Pathway Figure 16.7	166 166 167 168	Lung Volumes Figure 19.25 Inspiration Figure 19.30 Respiratory Membrane Figure 19.32 Alveolar Gas Exchange Figure 19.34 Oxyhemoglobin Dissociation Curve	195 196 197 197
Lymphatic Capillaries Figure 16.8 Lymph Node Figure 16.9a Lymph Node Locations Figure 16.11 The Thymus Gland Figure 16.12 The Spleen Figure 16.14  R. Call and T. Call Origins, Figure 16.16	168 169 169 170 171 172	Figure 19.35 Oxyhemoglobin Figure 19.36 Carbon Dioxide Transport I Figure 19.40 Carbon Dioxide Transport II Figure 19.42 Respiratory System InnerConnections:	198 199 200 201
B-Cell and T-Cell Origins Figure 16.16 The Complement System Figure 16.19 B-Cell Activation Figure 16.20 B-Cell and T-Cell Interaction Figure 16.21a B-Cell Proliferation Figure 16.22 Immediate-Reaction Allergy Figure 16.24a Lymphatic System InnerConnections: Chapter 16	172 173 174 175 176	Chapter 19  Chapter 20 Urinary System Figure 20.1 Kidney Structure Figure 20.4 Nephron Structure Figure 20.9 Juxtaglomerular Apparatus Figure 20.11 Glomerular Filtration Figure 20.15	203 204 205 206 207
Chapter 17 Digestive System Figure 17.1 The Small Intestine Figure 17.3 Mouth, Nasal Cavity, and Pharynx Figure 17.7 Major Salivary Glands Figure 17.11	178 178 179 180	Tubular Reabsorption Figure 20.19 The Countercurrent Multiplier Figure 20.23 Tubular Secretion Figure 20.25 Urinary Bladder Figure 20.29 Urinary System InnerConnections: Chapter 20	208 207 208 209 210
Swallowing Figure 17.14 Stomach Regions Figure 17.17 Gastric Glands Figure 17.19 Gastric Juice Secretion Figure 17.21 The Enterogastric Reflex Figure 17.23	181 182 183 183 184	Chapter 21 Fluid Compartments Figure 21.4 Acid-Base Imbalances Box 21.3, Figure 21D	211 211
The Pancreas Figure 17.24 Liver Figure 17.28 Gallbladder Figure 17.32 Intestinal Villus Figure 17.37 Fatty Acid Absorption Figure 17.44 Large Intestine Figure 17.45	184 185 185 186 187 188	Chapter 22 Male Reproductive System, Sagittal Figure 22.1a Male Reproductive System, Posterior Figure 22.1b	212 213
Digestive System InnerConnections: Chapter 17  Chapter 18 Food Pyramid Figure 18.16	189	Testis and Seminiferous Tubules Figure 22.3 Spermatogonia Figure 22.5b Penis Figure 22.11 Male Sexual Development Figure 22.14	214 215 216 216
"Nutrition Facts" Panel Figure 18.17  Chapter 19 Respiratory System Figure 19.1 Larynx Figure 19.6 Bronchial Tree Figure 19.12 Respiratory Tubes and Alveoli	191 192 193 194	Female Reproductive System Figure 22.15a Female Pelvic Cavity Figure 22.15b The Ovaries Figure 22.16 Oogenesis Figure 22.17a Ovarian Cycle Figure 22.22 Infundibulum Figure 22.23	217 217 218 218 219 219

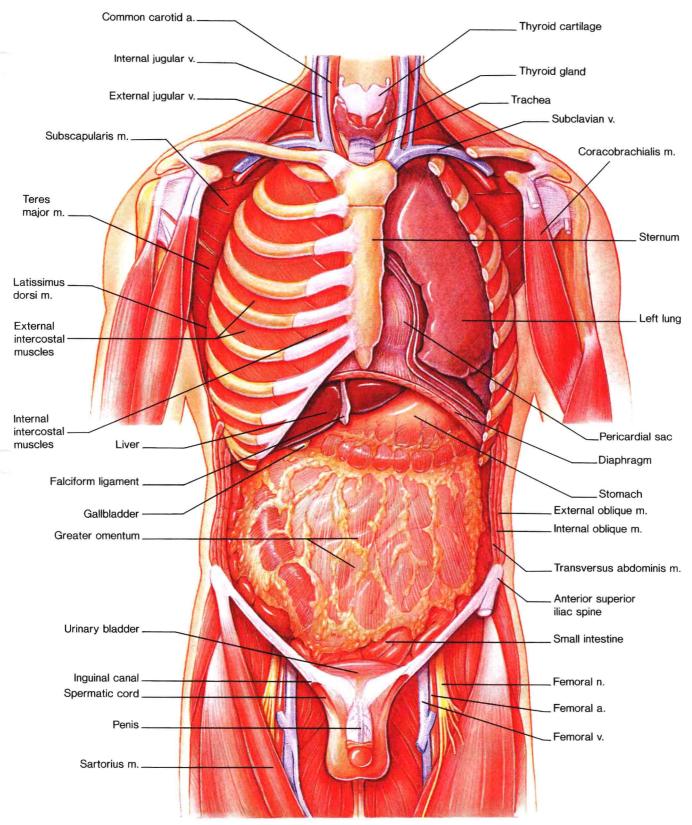
Female Sexual Development Figure 22.28 Fertilization Figure 22.32	220 221	Placenta Figure 23.13 Umbilical Cord Figure 23.14	228 239
Early Human Development Figure 22.33	222	The Developing Placenta Figure 23.15	230
Positive Feedback Mechanism		Maternal Blood Figure 23.21	231
Figure 22.36	222	Fetal Circulation   Figure 23.22a	232
Stages in Birth Figure 22.37	223	Fetal Circulation II Figure 23.22b	233
Structure of the Breast Figure 22.38	224	Newborn's Circulatory System	
Reproductive System InnerConnections:		Figure 23.24	234
Chapter 22	225		
		Chapter 24	
Chapter 23		First Meiotic Division Figure 24.4	234
Primary Germ Layers Figure 23.6	226	Crossing Over Figure 24.5	235
Human Embryonic Development		Second Meiotic Division Figure 24.6	235
Figure 23.11	227	Maternal and Paternal Traits Figure 24.7	236
Villus, Figure 23.12	228	Ç	



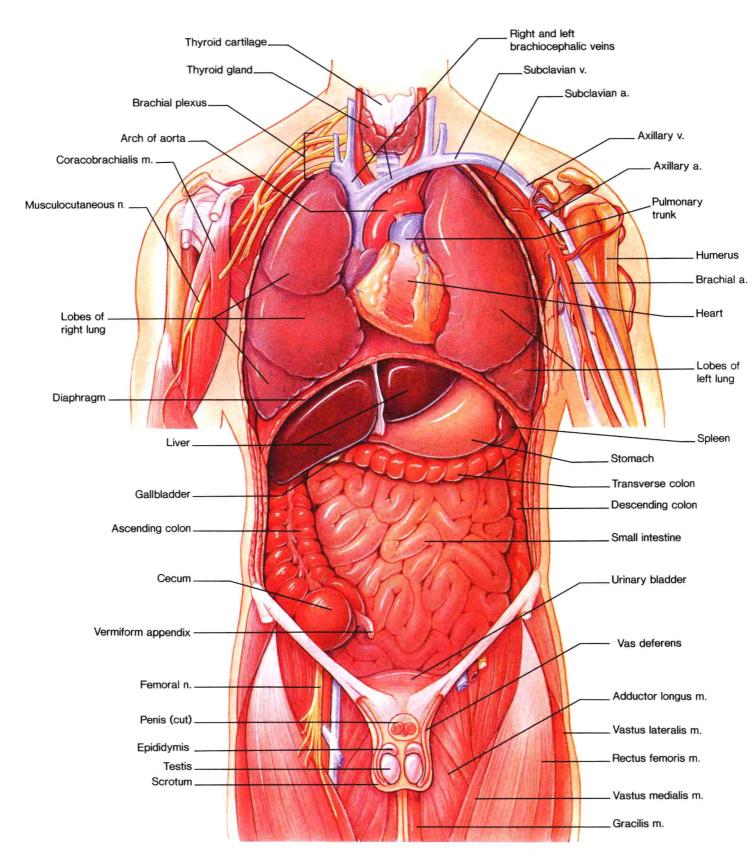
Human Torso, Anterior Surface and Superficial Muscles Reference Plate 1



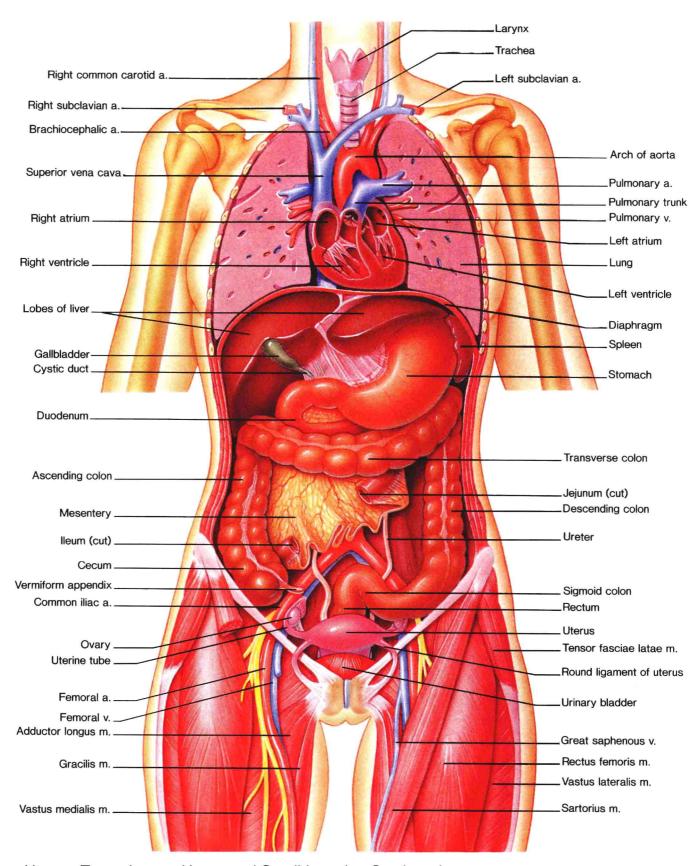
Human Torso, Deeper Muscle Layers Reference Plate 2



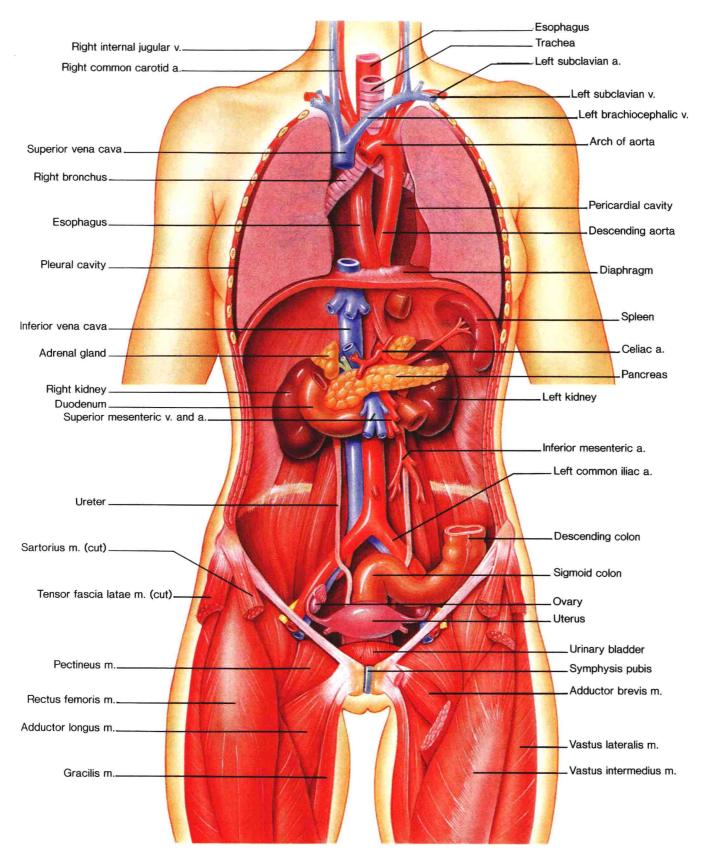
Human Torso, Abdominal Viscera Reference Plate 3



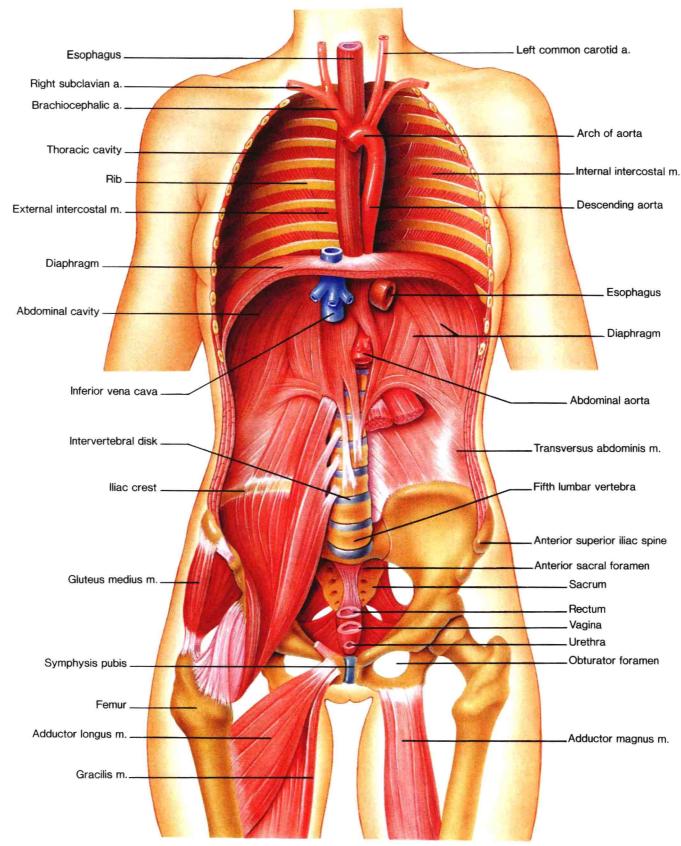
Human Torso, Thoracic Viscera Reference Plate 4



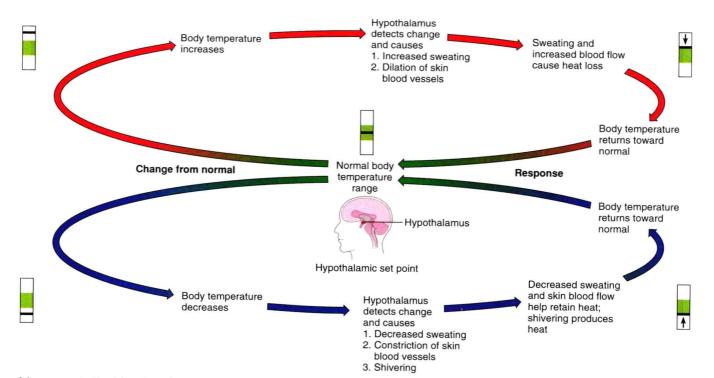
Human Torso, Lungs, Heart, and Small Intestine Sectioned Reference Plate 5



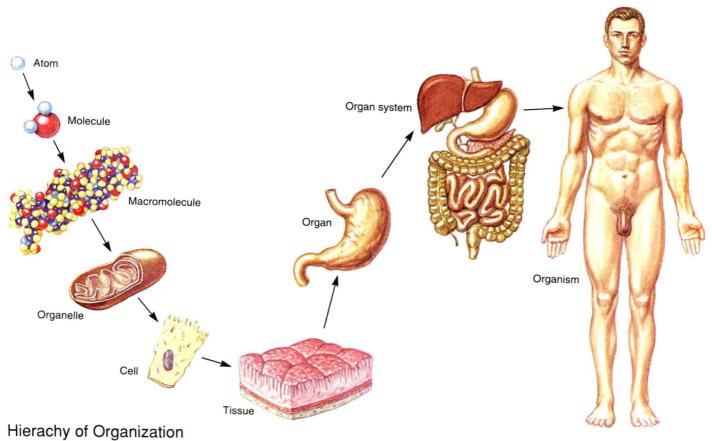
Human Torso, Heart, Stomach and Part of Intestine and Lungs Removed Reference Plate 6



Human Torso, Visceral Organs Removed Reference Plate 7



Homeostatic Mechanism Figure 1.5



Hierachy of Organization Figure 1.6