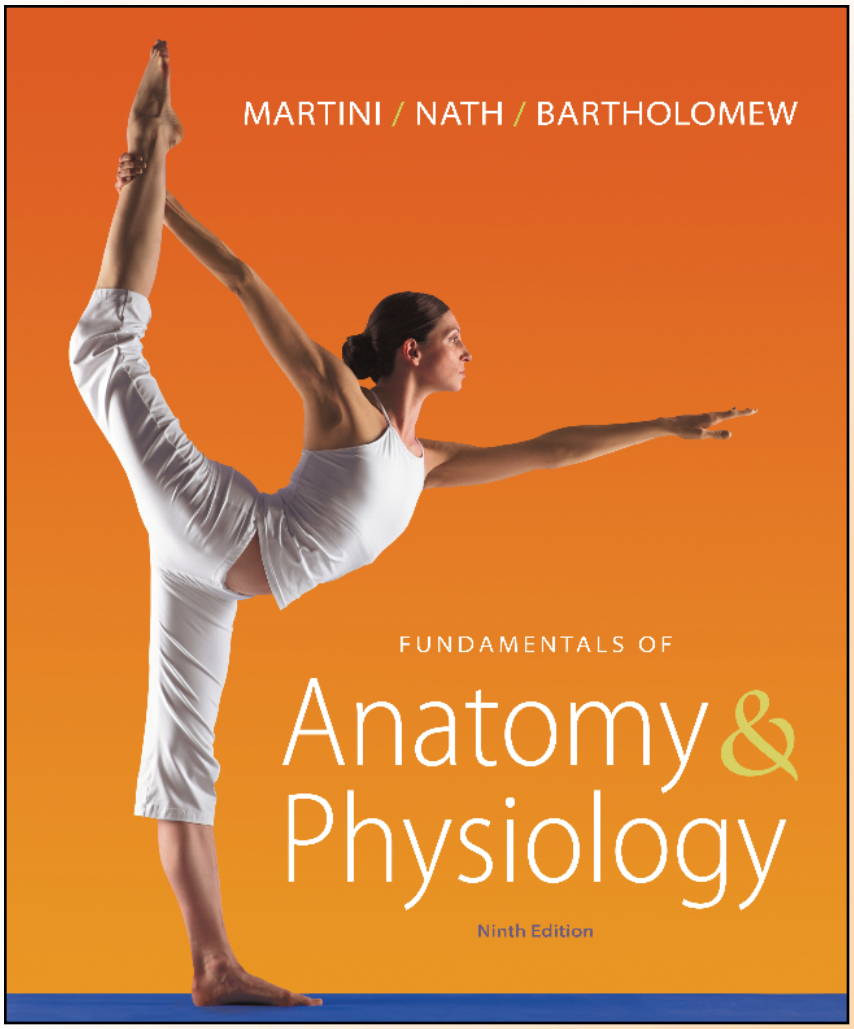

1

An Introduction to Anatomy & Physiology

PowerPoint® Lecture Presentations prepared by Jason LaPres

Lone Star College—North Harris

NOTE: Presentations extensively modified for use in MCB 244 & 246 at the University of Illinois by Drs. Kwast & Brown (2013-2014)

Chapter 1 Learning Objectives

- Describe the basic functions of organisms.
- Define anatomy & physiology and the various specialties of each.
- Identify and understand the major levels of organization of our bodies.
- Identify and describe the 11 organ systems of the body.
- Understand and be able to explain the concept of “homeostasis” and describe the roles of negative and positive feedback in regulating body functions.
- Identify the major body cavities using proper anatomical terms.

Anatomy & Physiology: The study of structure-function relationships in biology

- Anatomy
  - Describes the **structures** of the body including
    - What they are made of
    - Where they are located
    - Associated structures
- Physiology
  - Is the study of the function of biological systems including, of course, anatomical structures
    - It includes both individual and cooperative functions
- Anatomy & Physiology: forms the foundation for understanding the body's parts and functions in concert.

Introduction – A Brief History of Anatomy

- Anatomy (anatome = to cut up): study of "cutting up" of the structural parts
- Oldest medical science; cadaver dissection (dis = apart; secare = to cut)

Egypt:

- Anatomical or Edwin Smith Surgical Papyrus (1600 BCE):
  - Contains 48 case histories of medical trauma and their treatment; describes closing wounds with sutures, preventing and curing infection with honey, stopping bleeding with raw meat as well as immobilizing the head and neck to prevent spinal cord injuries during transport.
  - Also contain the first known descriptions of the cranial sutures, meninges, external surface of the brain, cerebrospinal fluid, and intracranial pulsations. Also basic anatomy of major organs and blood vessels as well as use of plants for treating medical conditions.

Greece:

- Hippocrates (5th & 4th century BCE) – Greek physician/medical scientist
- Aristotle (4th century BCE) – text based in animal dissections: arteries, veins, organs and organ systems
- Herophilos & Erasistratus (4th century BCE) – extensive cadaver dissections

Introduction – A Brief History of Anatomy Cont…

Greece Cont.: Herophilos & Erasistratus even performed vivisections on criminals!

- Claudius Galenus (a.k.a. Galen of Pergamon (Turkey)--2nd century BCE) – compiled previous knowledge and filled in gaps with animal (*e.g.,* monkey & pig) dissections ("Ancient World's Gray's Anatomy" [1500 years]) – physician to Roman Emperors

- **Renaissance** (1500s)— Andreas Vesalius ("*De humani corporis fabrica*" – *On the workings of the human body)* – founder of modern human anatomy

- Gallows (Roman 14th – 16th BCE) & Graves (Michelangelo 17th – 18th century)

- Galileo charged admission for traveling cadaver dissections

- Anatomy Act of 1832 (UK) – finally provided for an adequate legal supply of cadavers for medicine (lead to Gray's Anatomy) *[Murder Act of 1752 --stipulated that only the bodies of convicted murderers were allowed for legal dissection]*

- *What about recent advances? Are there any or has it all been done? ...*

Introduction – Modern Anatomical Projects

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National Library of Medicine
National Institutes of Health

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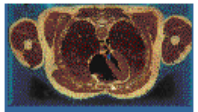


Projects Based on the Visible Human Data Set

- Applications for viewing images
- Sources of images and animations
- Products

Mirror Sites

Tools

Media Productions

Related Projects

Funding Sources

The Visible Human Project®

Overview

The Visible Human Project® is an outgrowth of the NLM's 1986 Long-Range Plan. It is the creation of complete, anatomically detailed, three-dimensional representations of the normal male and female human bodies. Acquisition of transverse CT, MR and cryosection images of representative male and female cadavers has been completed. The male was sectioned at one millimeter intervals, the female at one-third of a millimeter intervals.

The long-term goal of the Visible Human Project® is to produce a system of knowledge structures that will transparently link visual knowledge forms to symbolic knowledge formats such as the names of body parts.

Further Information

- **General Information**
  - A description of The Visible Human Project® image data and how to obtain it (includes license agreement documents).
  - The Visible Human Project® FactSheet.
  - A sampler of images and animations from the Project.
  - The Visible Human Project®: From Data to Knowledge: An update of ongoing National Library of Medicine VHP initiatives.
  - Digitally encoded videos - requires RealPlayer.
- **NLM Initiatives**
  - Cryosection, MRI and CT image data of the head of a 72 year old male. Cryosections done at 0.174mm intervals and photographed at a resolution of 1056 x 1528 pixels. Work done at Brigham and Women's Hospital, Harvard Medical School, under contract to NLM. Available only to VHP license holders. These images can be found in the directory BWH_Harvard when logged on to the NLM image server.
  - AnatLine: a prototype system consisting of an anatomical image database and an online browser developed at the National Library of Medicine.
  - AnatQuest: the overall goal of the AnatQuest project is to explore and implement new visually and compelling ways to bring anatomic images from the Visible Human dataset to the general public. Includes 3D renderings and labeled views.
  - Insight Toolkit (ITK): an open-source software toolkit for performing registration and segmentation, developed by six principal organizations under contract to the NLM, three commercial (Kitware, GE Corporate R&D, and Insightful), and three academic (UNC Chapel Hill, University of Utah, and University of Pennsylvania).
  - The Visible Human Project ATLAS of Functional Human Anatomy, version 1.0 The Head and Neck, developed under contract to the NLM by the University of Colorado Center for Human Simulation.
- **Information from the contractors for the Project**
  - University of Colorado Health Sciences Center (primary)
  - National Center for Atmospheric Research
- **Proceedings from The Visible Human Project Conferences** - The information presented here is identical to that distributed on CD-ROM to conference attendees. Please refer to section "Disc Info" or "About This CD-ROM", for pertinent information.
  - The Visible Human Project® Conference, 1996
  - The Second Visible Human Project® Conference, 1998
  - The Third Visible Human Project® Conference, 2000

Introduction – Human Anatomy ***as Art?***

- Body Worlds™, Bodies™, etc. = traveling exhibitions of preserved human bodies prepared using a technique called plastination (German anatomist Gunther von Hagens - water and fat replaced by acetone then plastics [silicone rubber, polyester & epoxy resins] – up to 12 month process); have done animals as large as horses.
- Controversial: Who are these people and were they willing participants?
- Also debate over Texas inmate used in Visible Human Project
- Finally, there continue to be advances in paleopathology, showing evolution of the human form (not only from distant relatives but of modern humans—height)

Introduction – Human Physiology

- Physiology comes from Ancient Greek: *physis*, "nature, origin"; and -logia, "study of".
- Anatomy & Physiology together is the study of structure-function relationships in biological systems
- Human Physiology is the study of the mechanical, physical, and biochemical functions of humans, their organs, and the cells of which they are composed.
- Physiology includes: Biochemistry, Biophysics, Cell Biology & Chemistry, Endocrinology, Genetics, Genomics, Immunology, Kinesiology, Neurobiology, Pathology, etc.

Introduction – Brief History of Human Physiology

- Human physiology dates back to the time of Hippocrates — father of modern medicine (5th century BCE)
- Claudius Galenus [a.k.a. Galen of Pergamon] (c. 126-199 A.D.) used experiments to probe body functions; the founder of experimental physiology.
- Middle Ages — the Muslim physician Avicenna (980-1037) introduced experimentation and quantification in *The Canon of Medicine*.
- Ibn al-Nafis (1213–1288) — first physician to correctly describe the anatomy of the heart, the coronary circulation, the structure of the lungs, and the pulmonary circulation
- Renaissance (1500s)— Andreas Vesalius (*De humani corporis fabrica)* – founder of modern human anatomy
- Herman Boerhaave (Leiden 1708) — father of clinical physiology — textbook *Institutiones medicae*

Introduction – Brief History of Human Physiology

- 19th century — Cell theory of Schleiden & Schwann, which “radically” stated that organisms are made up of units called ***cells.***
- Claude Bernard's (1813–1878) concept of milieu interieur (internal environment), which would later be taken up and championed as "homeostasis" by American physiologist Walter Cannon (1871–1945)
- 20th century — comparative physiology and ecophysiology (Knut Schmidt-Nielsen and George Bartholomew). Most recently, evolutionary physiology has become a distinct subdiscipline.
- Recent advances are in the Systems Biology subdisciplines, such as physiological genomics (functional genomics)
- In addition, advances in cell physiology/ biology can be expected for decades (centuries?)
- Physiology IS at the center of systems biology and, indeed, personalized medicine.

1-4 Relationships between Anatomy & Physiology

- Anatomy
  - **Gross anatomy**, or macroscopic anatomy, examines large, visible structures
    - *Surface anatomy:* exterior features
    - *Regional anatomy:* body areas
    - *Systemic anatomy:* **organ systems**
    - *Developmental anatomy:* from conception to death
    - *Clinical anatomy:* medical specialties

1-4 Relationships between Anatomy & Physiology

- Anatomy
  - **Microscopic anatomy** examines cells and molecules
    - **Cytology:** study of **cells** and their structures
      - *cyt-* = cell
    - **Histology:** study
      - hist- = tissue

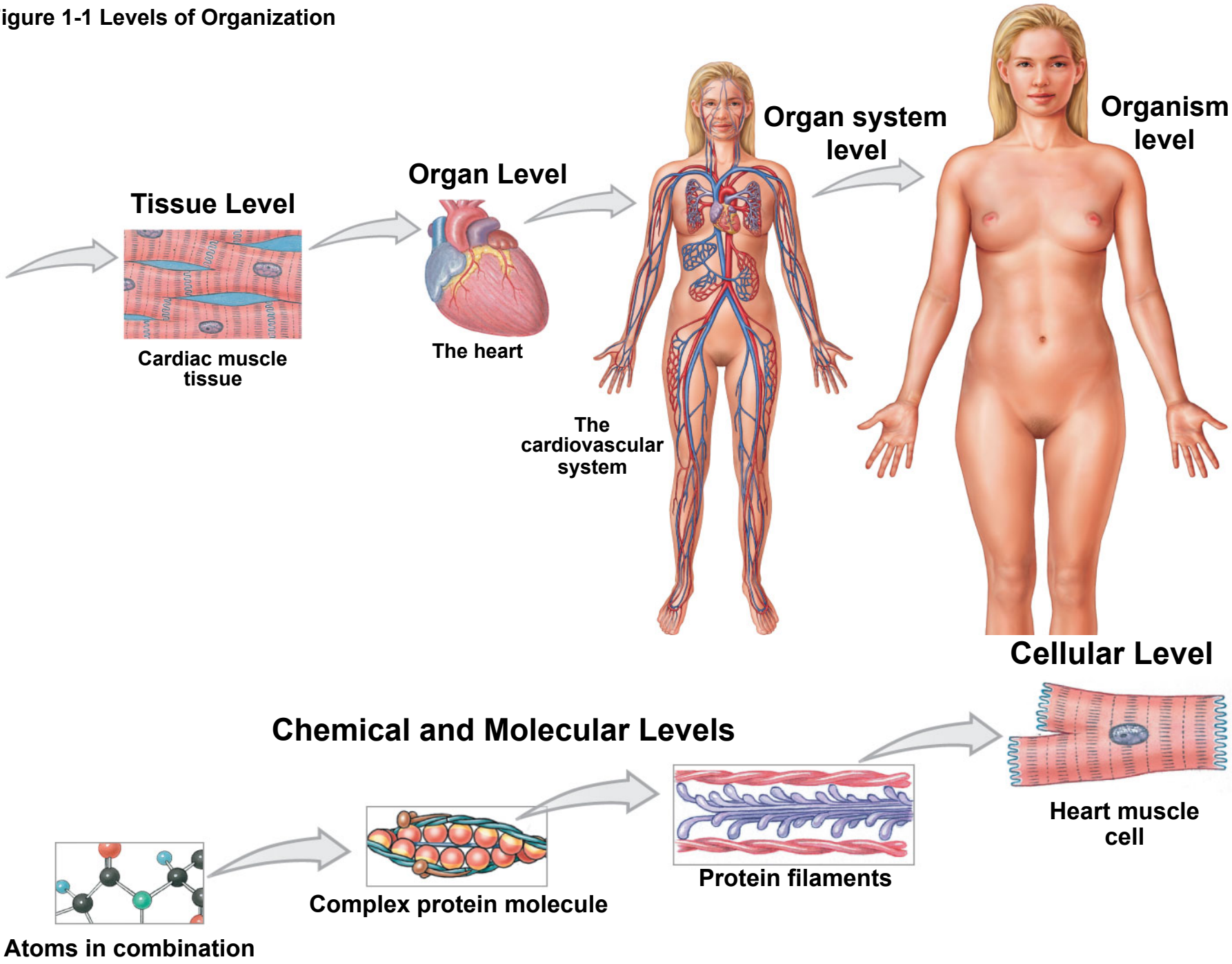
1-4 Relationships between Anatomy & Physiology

- Physiology Subdisciplines
  - ***Cell physiology****:* processes within and between cells
  - ***Organ physiology:*** functions of specific organs
  - ***Systemic physiology****:* functions of an organ system
  - ***Pathological physiology:*** effects of diseases

1-5 Levels of Organization

- ***Chemical (or Molecular)***
  - Chemical, Mechanical and Electrical events that occur within and between cells
- ***Cellular***
  - The fundamental compartments of all known living organisms and the molecules and organelles within working together
- ***Tissue***
  - Group of cells working together in a concerted manner
- ***Organ***
  - A group of tissues working together to perform specific functions
- ***Organ System***
  - An **organ system** is a group of organs working together
  - Humans have 11 organ systems
- ***Organism***
  - A human is an **organism**

Figure 1-1 Levels of Organization



1-5 Levels of Organization – Organ Systems (11)

- ***Integumentary (Chpt 5)***

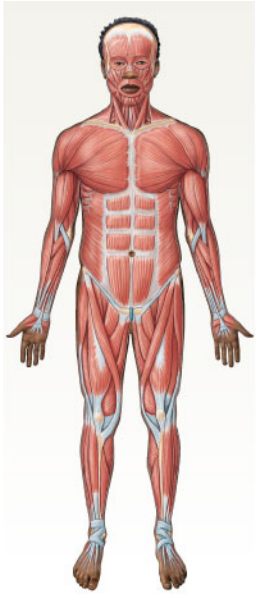
  - **Major Organs**
    - Skin
    - Hair
    - Sweat glands
    - Nails
  - **Functions**
    - Protects against environmental hazards
    - Helps regulate body temperature
    - Provides sensory information

- ***Skeletal (Chpts 6-9)***

  - **Major Organs**
    - Bones (>270)
    - Cartilages
    - Associated ligaments
    - Bone marrow
  - **Functions**
    - Provides support and protection for other tissues
    - Stores calcium and other minerals
    - Forms blood cells

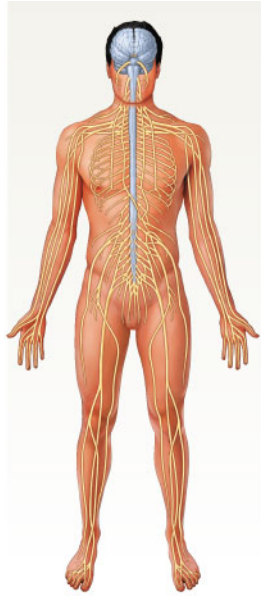
1-5 Levels of Organization – Organ Systems (11)

- ***Muscular (Chpts 10-11)***



  - **Major Organs**
    - Skeletal muscles (>650) and associated tendons
  - **Functions**
    - Provides movement
    - Provides protection and support for other tissues
    - Generates heat that maintains body temperature

- ***Nervous (Chpts 12-17)***



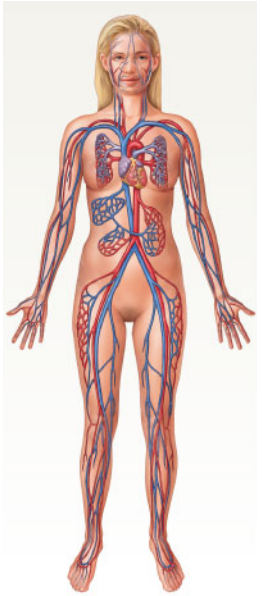
  - **Major Organs**
    - Brain
    - Spinal cord
    - Peripheral nerves
    - Sense organs
  - **Functions**
    - Directs immediate responses to stimuli
    - Coordinates or moderates activities of other organ systems
    - Provides and interprets sensory information about external conditions

1-5 Levels of Organization – Organ Systems (11)

- ***Endocrine (Chpt 18)***

  - **Major Organs**
    - Pituitary gland
    - Pancreas
    - Thyroid gland
    - Gonads
    - Adrenal glands
    - Endocrine tissues in other systems
  - **Functions**
    - Directs long-term changes in the activities of other organs
    - Adjusts metabolic activity and energy use by the body
    - Controls structural & functional changes during development

- ***Cardiovascular (Chpts 19-21)***



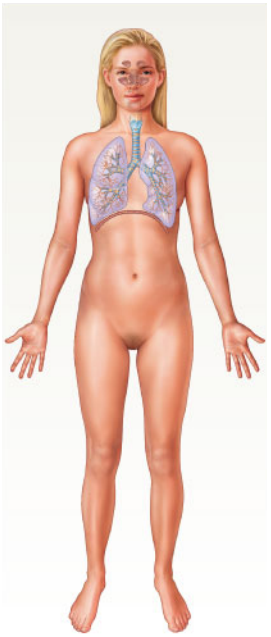
  - **Major Organs**
    - Heart
    - Blood
    - Blood vessels
  - **Functions**
    - Distributes blood cells, water and dissolved materials including nutrients, waste products, oxygen, and carbon dioxide
    - Distributes heat and assists in control of body temperature

1-5 Levels of Organization – Organ Systems (11)

- ***Lymphatic (Chpt 22)***

  - **Major Organs**
    - Spleen
    - Thymus
    - Lymphatic vessels
    - Lymph nodes
    - Tonsils
  - **Functions**
    - Defends against infection and disease
    - Returns tissue fluids to the bloodstream

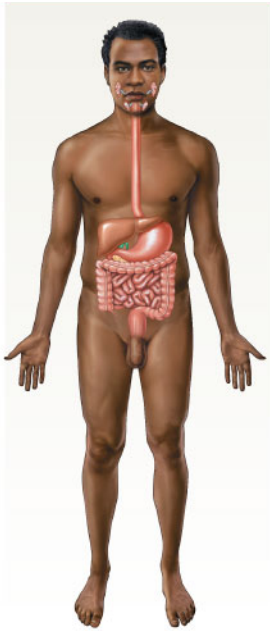
- ***Respiratory (Chpt 23)***



  - **Major Organs**
    - Nasal cavities
    - Sinuses
    - Larynx
    - Trachea
    - Bronchi
    - Lungs
    - Alveoli
  - **Functions**
    - Delivers air to alveoli
    - Provides oxygen to bloodstream
    - Removes carbon dioxide from bloodstream
    - Produces sounds for communication

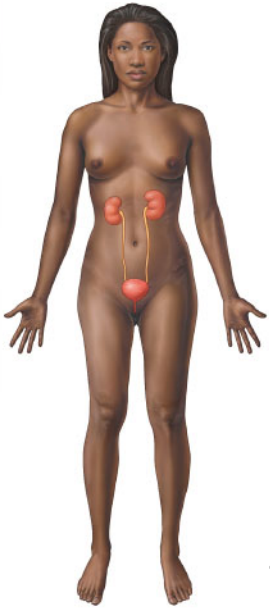
1-5 Levels of Organization – Organ Systems (11)

- ***Digestive (Chpts 24-25)***



- **Major Organs**
  - Teeth
  - Tongue
  - Pharynx
  - Esophagus
  - Stomach
  - Small intestine
  - Large intestine
  - Liver
  - Gallbladder
  - Pancreas
- **Functions**
  - Processes and digests food
  - Absorbs and conserves water
  - Absorbs nutrients
  - Stores energy reserves

- ***Urinary (Chpts 26-27)***



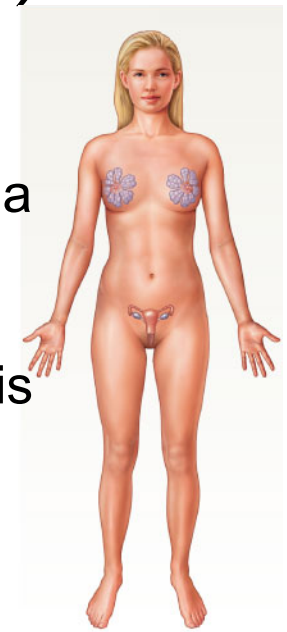
- **Major Organs**
  - Kidneys
  - Ureters
  - Urinary bladder
  - Urethra
- **Functions**
  - Excretes waste from the blood
  - Controls water balance by regulating volume of urine produced
  - Stores urine prior to voluntary elimination
  - Regulates blood ion concentrations and pH

1-5 Levels of Organization – Organ Systems (11)

- ***Male & Female Reproduction (Chpts 28-29)***

- **Major Organs**
  - Testes
  - Epididymides
  - Ductus deferentia
  - Seminal vesicles
  - Prostate gland
  - Penis and Scrotum
- **Functions**
  - Produces male sex cells (sperm), suspending fluids, and hormones
  - Sexual intercourse

- **Major Organs**
  - Ovaries
  - Uterine tubes
  - Uterus
  - Vagina
  - Labia
  - Clitoris
  - Mammary glands
- **Functions**
  - Produces female sex cells (oocytes) and hormones
  - Supports developing embryo from conception to delivery
  - Provides milk to nourish newborn infant
  - Sexual intercourse



1-6 Homeostasis – Keeping our organ systems in balance

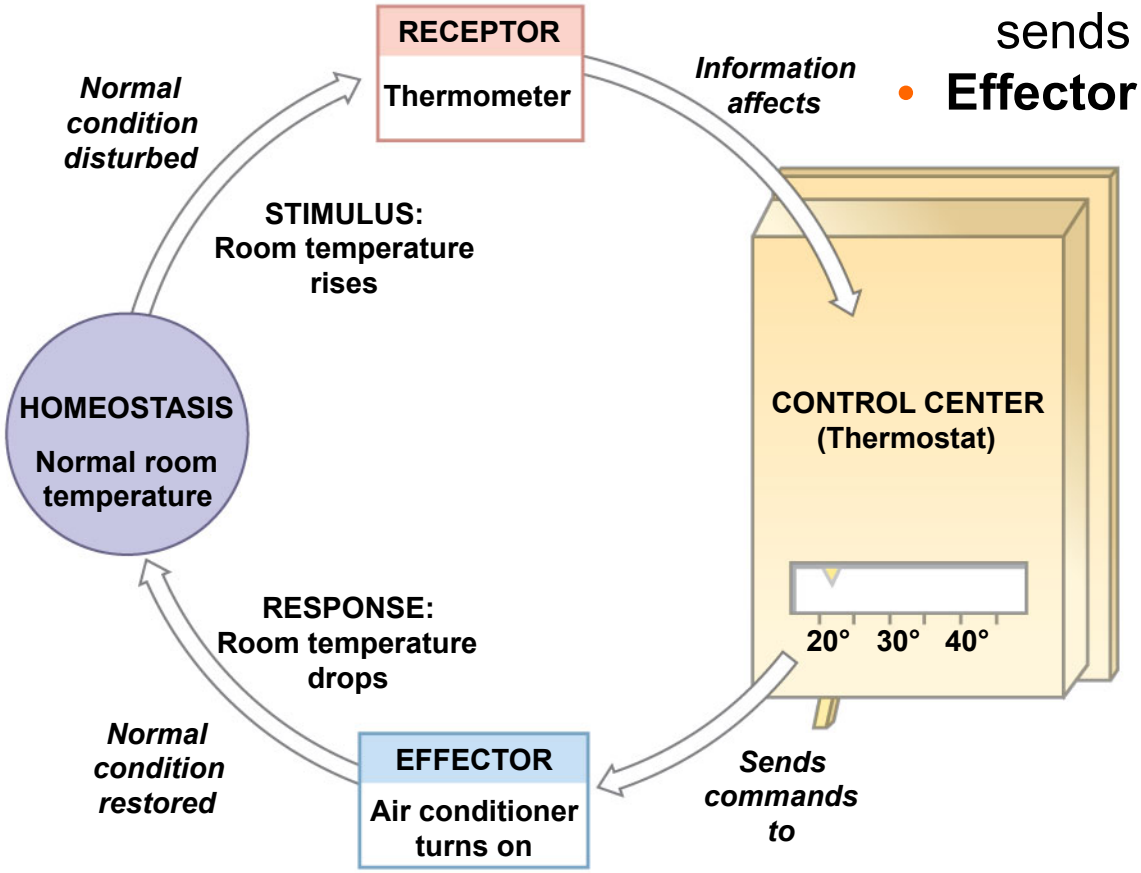
- ***Homeostasis****:* the ability of an organism to harness mechanisms for the preservation (maintenance) of an almost *constant* ***internal*** *state* in the face of perturbations
- *Homeostasis* first put forth by Claude Bernard and later championed by Walter Cannon
  - Systems respond to external and internal changes to function within a **normal range** (body temperature, fluid balance, etc.)
  - Both passive and active mechanisms involved

1-6 Homeostasis

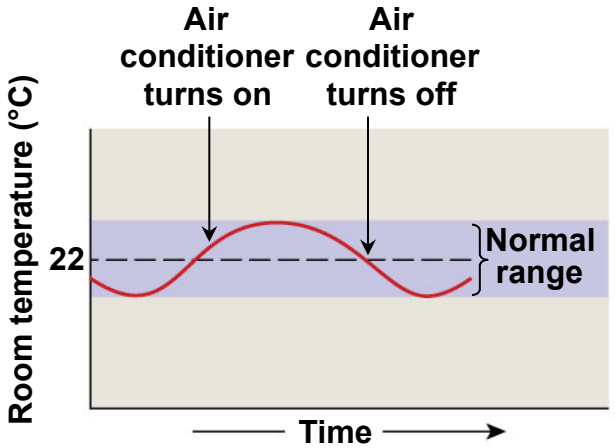
- Mechanisms of Regulation
  - **Autoregulation (intrinsic)**
    - Automatic response in a cell, tissue, or organ to some environmental change *(e.g., cells release chemicals in response to decline in O_2 during exercise that increase blood vessel dilation and thus blood flow to active tissues)*
  - **Extrinsic regulation**
    - Simultaneous control of several systems ***by nervous or endocrine input*** *(e.g., nervous system control of heart rate and central and peripheral blood flow to active tissues in low O_2)*

Figure 1-2 The Control of Room Temperature

- **Required Parts for Control:**
  - **Receptor –** Receives stimulus
  - **Control center** - processes signal & sends instructions
  - **Effector –** Carries out instructions

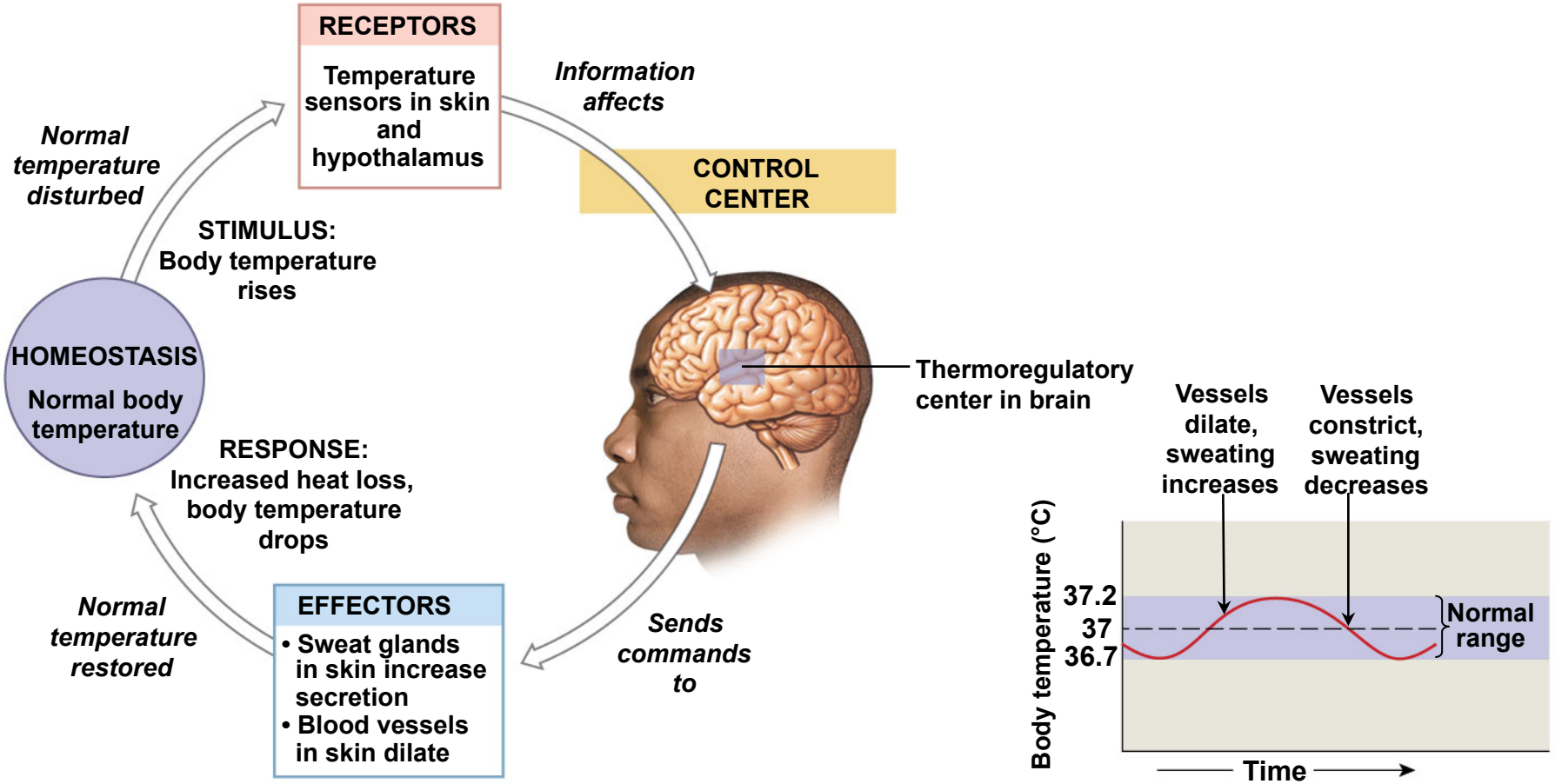


a In response to input from a receptor (a thermometer), a thermostat (the control center) triggers an effector response (either an air conditioner or a heater) that restores normal temperature. In this case, when room temperature rises above the set point, the thermostat turns on the air conditioner, and the temperature returns to normal.



b With this regulatory system, room temperature fluctuates around the set point.

Figure 1-3 Negative Feedback in the Control of Body Temperature



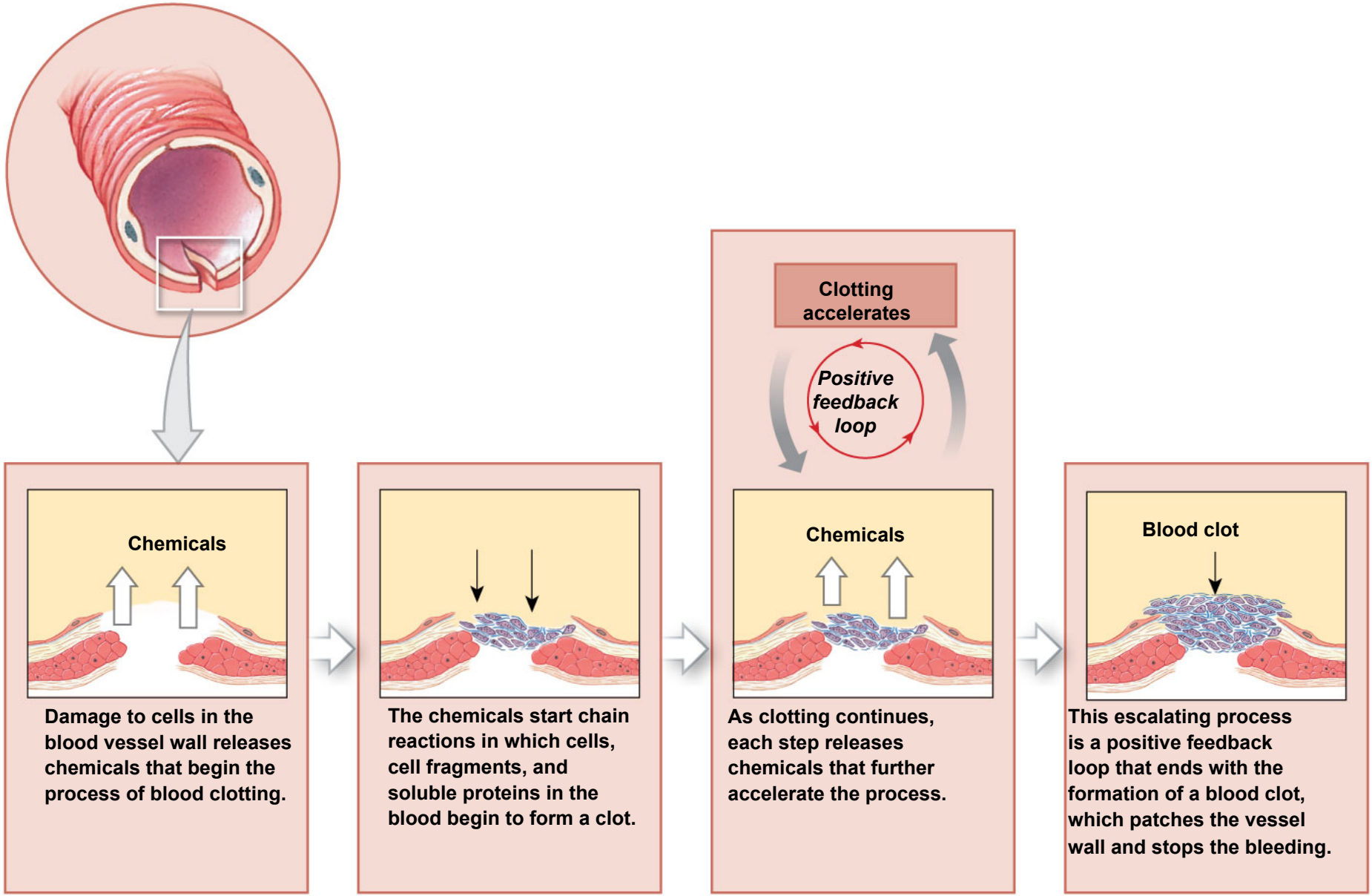
a Events in the regulation of body temperature, which are comparable to those shown in *Figure 1-2.* A control center in the brain (the hypothalamus) functions as a thermostat with a set point of 37°C. If body temperature exceeds 37.2°C, heat loss is increased through enhanced blood flow to the skin and increased sweating.

b The thermoregulatory center keeps body temperature fluctuating within an acceptable range, usually between 36.7 and 37.2°C.

1-7 Negative and Positive Feedback

- **The Role of Negative Feedback**
  - The response of the **effector negates** the **stimulus or disturbance (*i.e.,* inverts the signal)**
  - Body is brought back into homeostasis
    - **Normal range** is achieved
- **The Role of Positive Feedback**
  - The response of the **effector increases and amplifies** the **stimulus or disturbance (*i.e.,* in the same direction as the original signal)**
  - Body is moved ***away*** from current "set point"
    - **Normal range** is lost
  - Used to speed up certain processes (e.g., blood clotting, child birth)

Figure 1-4 Positive Feedback: Blood Clotting



1-7 Negative and Positive Feedback

- Systems Integration
  - Systems work together to maintain homeostasis
- Homeostasis is a **state of equilibrium**
  - Opposing forces are in balance
  - **Dynamic equilibrium** — continual adaptation
- Physiological systems work to restore balance
  - Failure results in **disease** or death

Table 1-1 The Roles of Organ Systems in Homeostatic Regulation

Table 1–1 The Roles of Organ Systems in Homeostatic Regulation

Internal Stimulus	Primary Organ Systems Involved	Functions of the Organ Systems
Body temperature	Integumentary system	Heat loss
	Muscular system	Heat production
	Cardiovascular system	Heat distribution
	Nervous system	Coordination of blood flow, heat production, and heat loss
Body fluid composition		
Nutrient concentration	Digestive system	Nutrient absorption, storage, and release
	Cardiovascular system	Nutrient distribution
	Urinary system	Control of nutrient loss in the urine
	Skeletal system	Mineral storage and release
Oxygen, carbon dioxide levels	Respiratory system	Absorption of oxygen, elimination of carbon dioxide
	Cardiovascular system	Internal transport of oxygen and carbon dioxide
Levels of toxins and pathogens	Lymphatic system	Removal, destruction, or inactivation of toxins and pathogens
Body fluid volume	Urinary system	Elimination or conservation of water from the blood
	Digestive system	Absorption of water; loss of water in feces
	Integumentary system	Loss of water through perspiration
	Cardiovascular system and lymphatic system	Distribution of water throughout body tissues
Waste product concentration	Urinary system	Elimination of waste products from the blood
	Digestive system	Elimination of waste products by the liver in feces
	Cardiovascular system	Transport of waste products to sites of excretion
Blood pressure	Cardiovascular system	Pressure generated by the heart moves blood through blood vessels
	Nervous system and endocrine system	Adjustments in heart rate and blood vessel diameter can raise or lower blood pressure

1-8 Anatomical Terminology

- Although we will often examine the integration of various organ systems in the maintenance of whole-body homeostasis, it is easier for introductory students to learn the anatomy and physiology of each organ system one at a time (Chapters 5 – 29).
- Thus, your text book begins with some basic anatomical terminology in Chapter 1 that we will now examine as it will be used throughout the two semestesr.

1-8 Anatomical Terminology

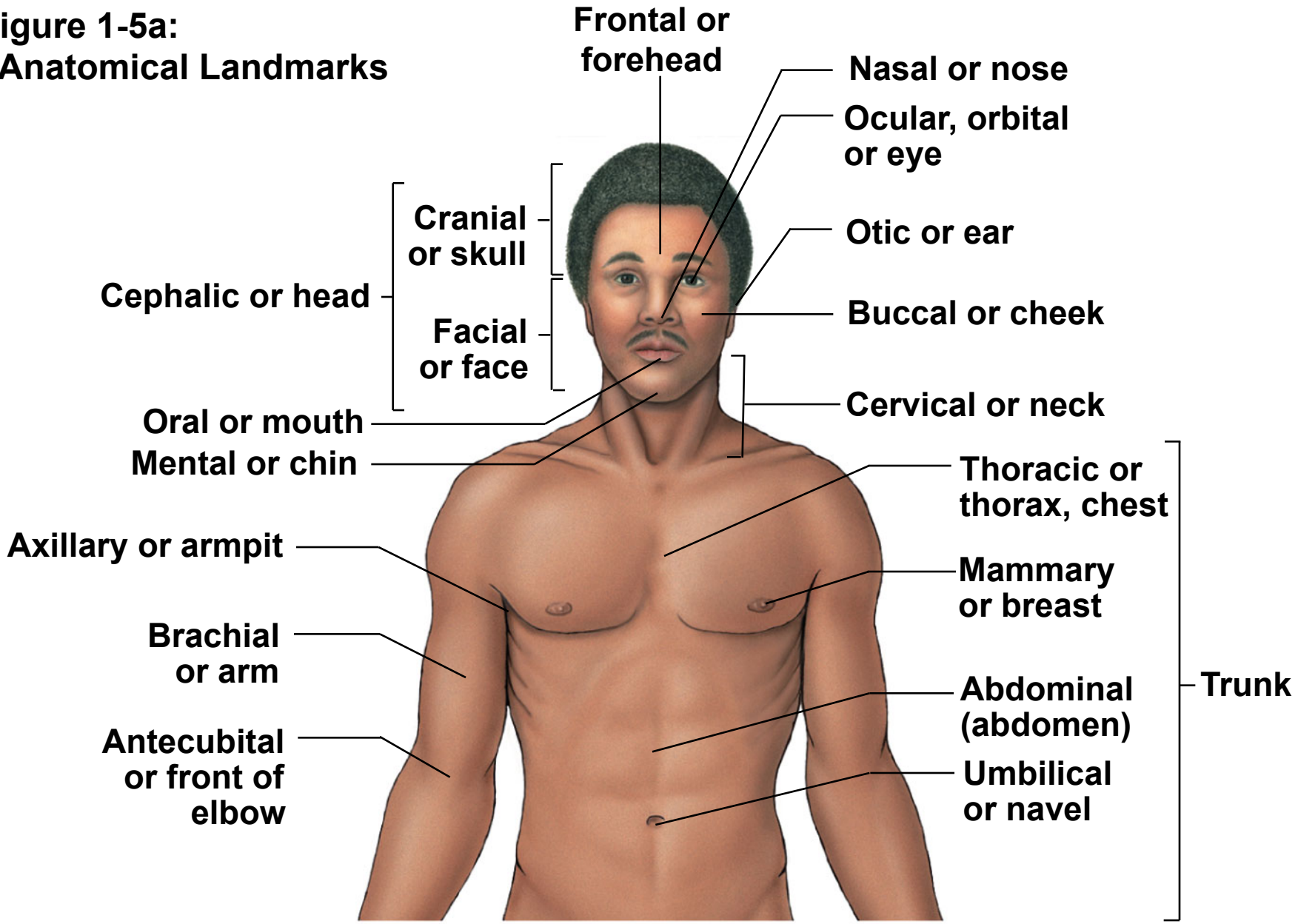
- **Anatomical position:** hands and arms extended at sides, palms forward, legs straight, feet together

Supine: lying down, face up

Prone: lying down, face down

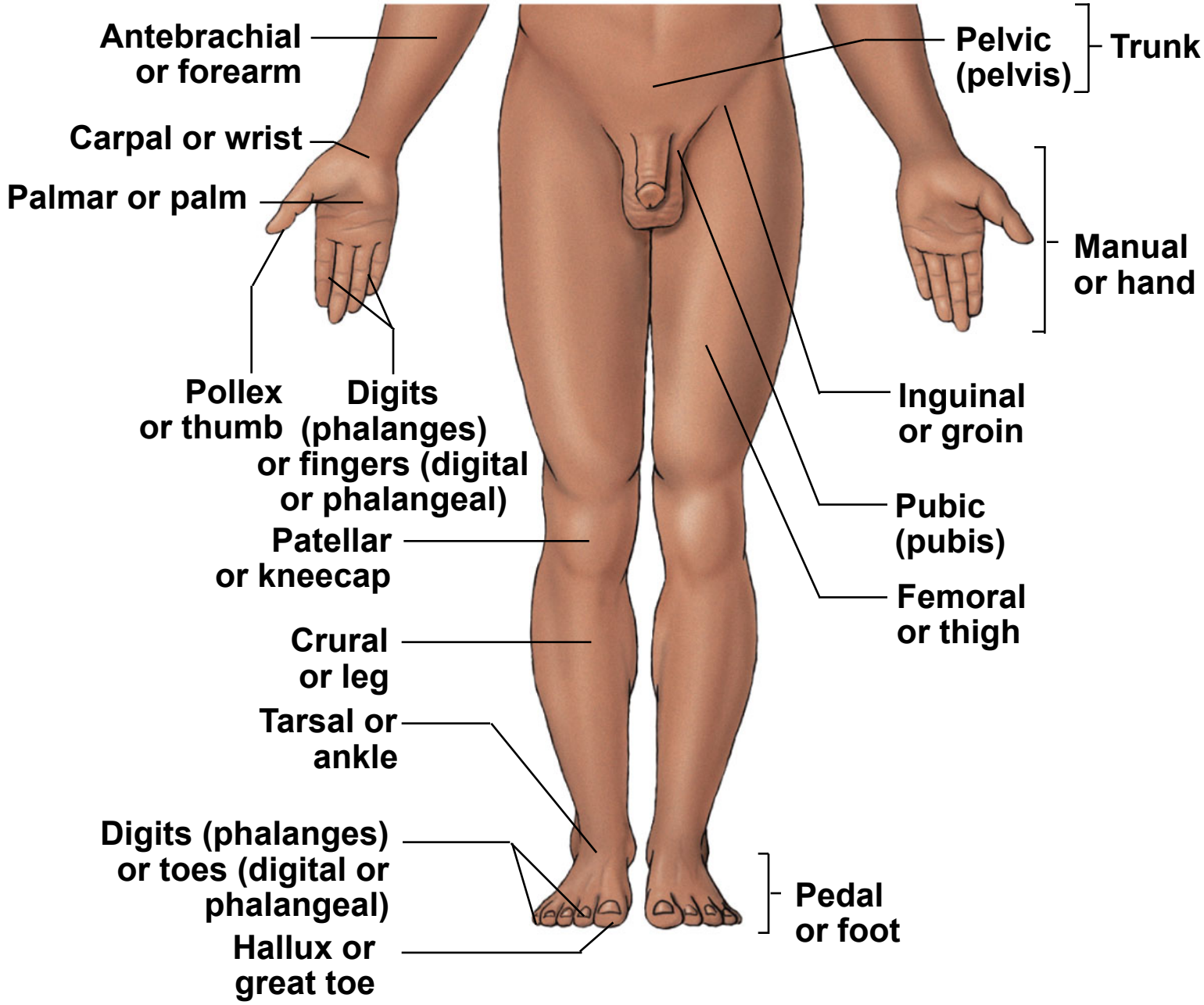
- **Superficial Anatomy** – structures on or near the body surface
- **Anatomical Landmarks**
    - References to palpable (those that can be felt or touched) structures
- **Anatomical Regions**
    - 4 Abdominopelvic quadrants – often used by clinicians
    - 9 Abdominopelvic regions – often used by anatomists
- **Anatomical Directions**
    - Reference terms based on subject

Figure 1-5a:
Anatomical Landmarks



a Anterior view

Figure 1-5a Anatomical Landmarks



a Anterior view

Figure 1-5b Anatomical Landmarks

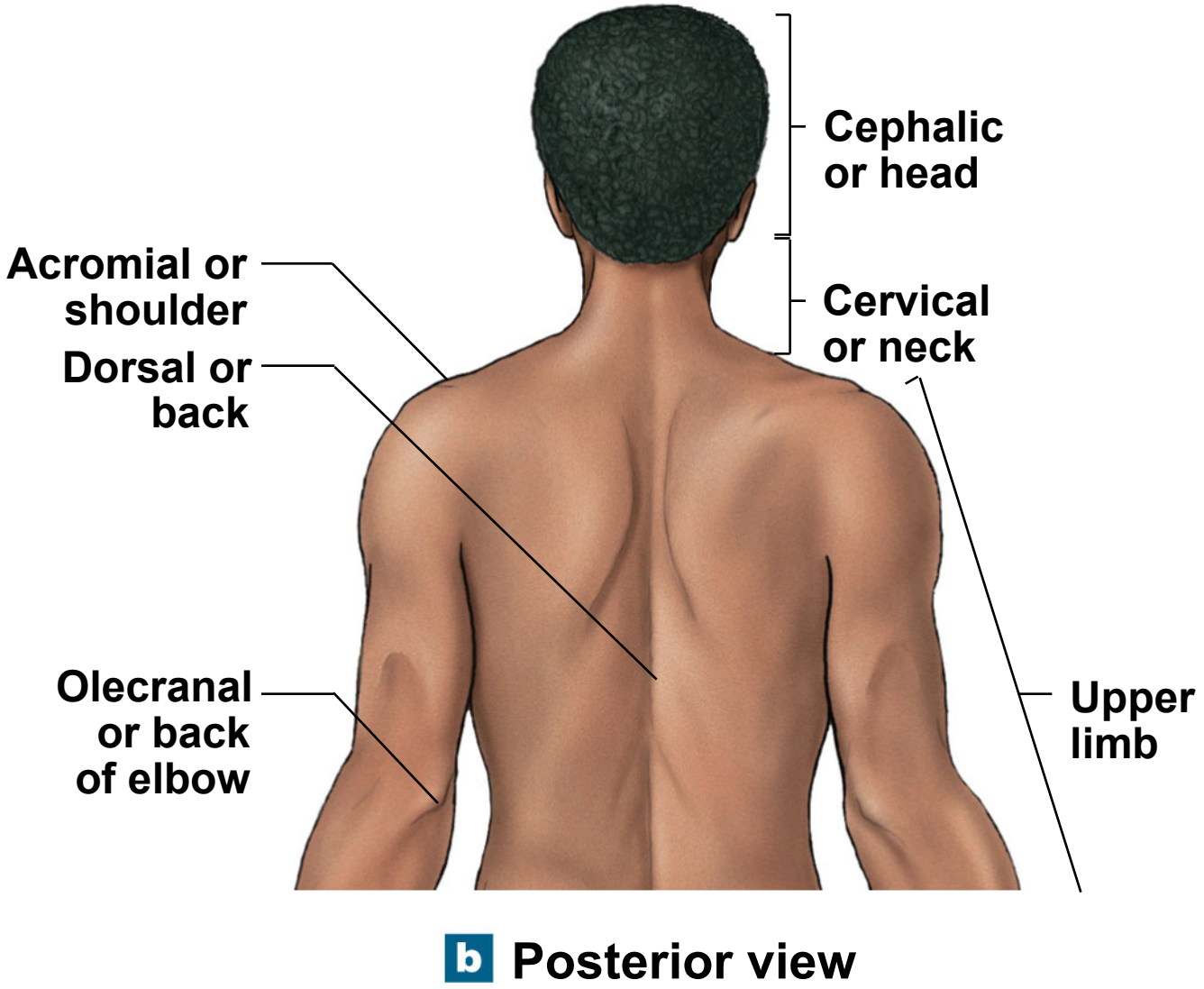
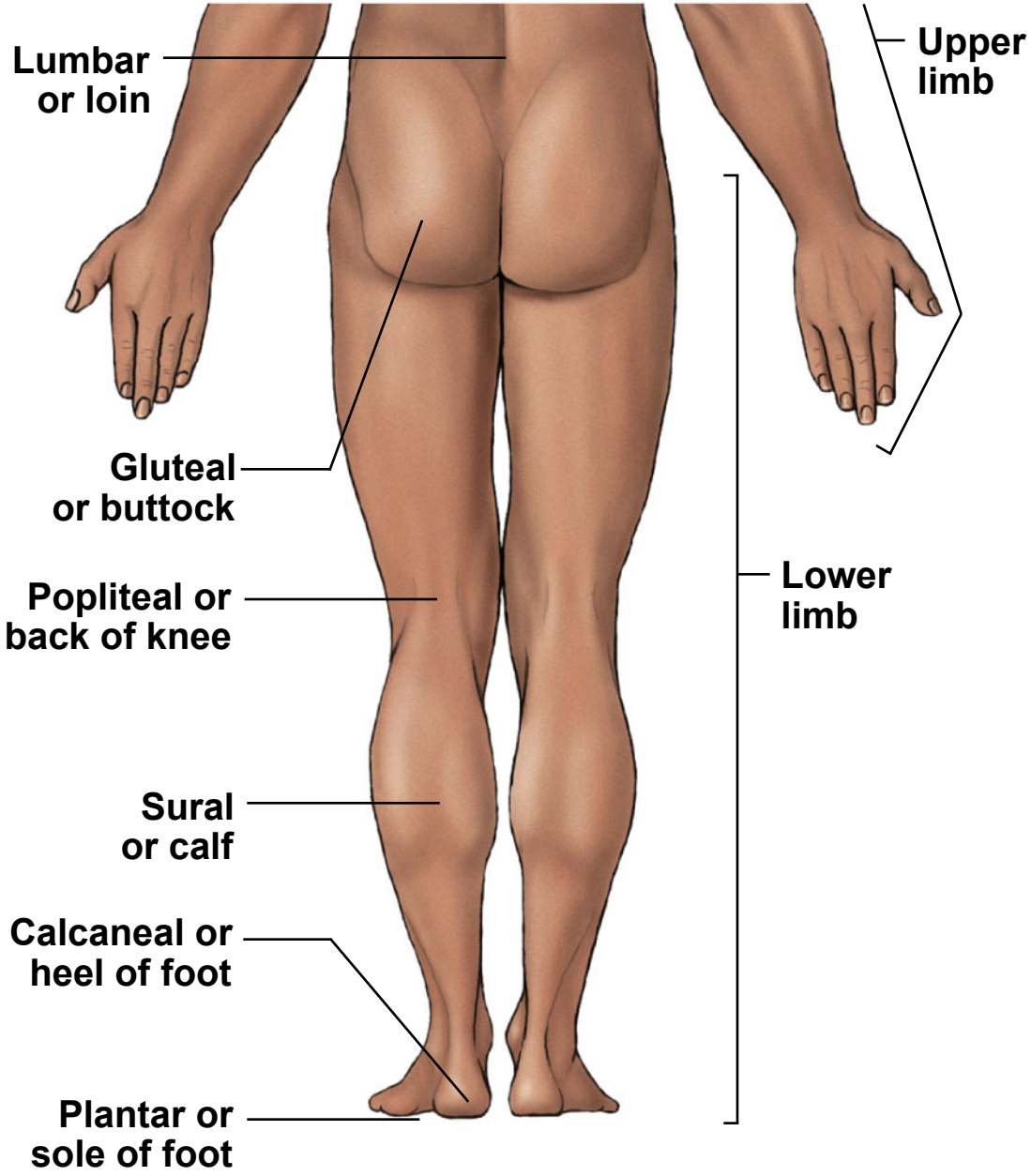
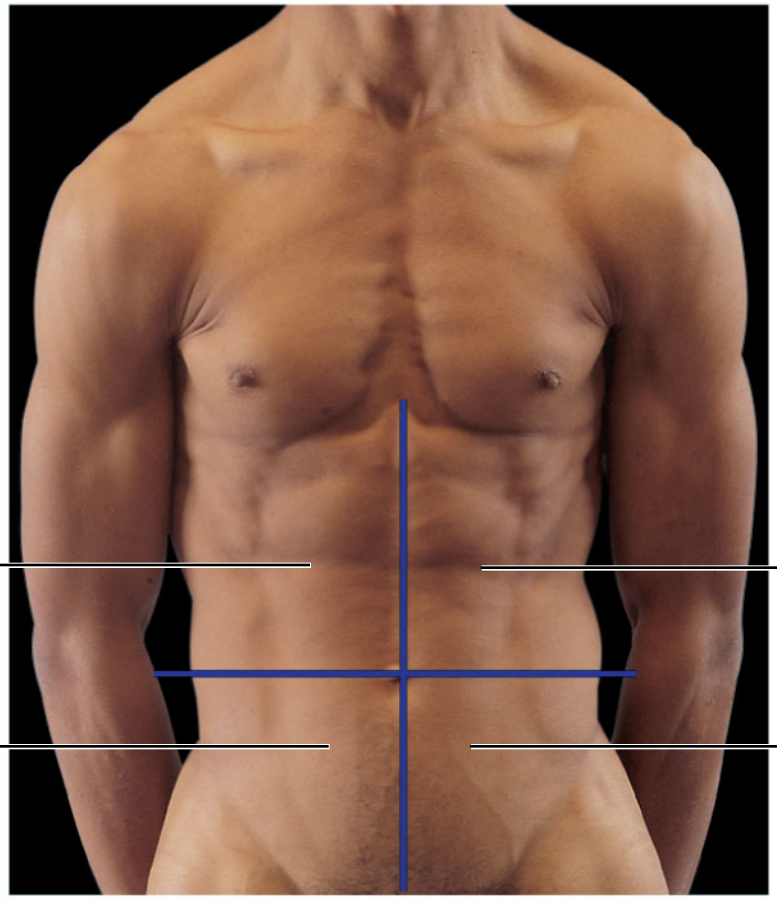


Figure 1-5b Anatomical Landmarks



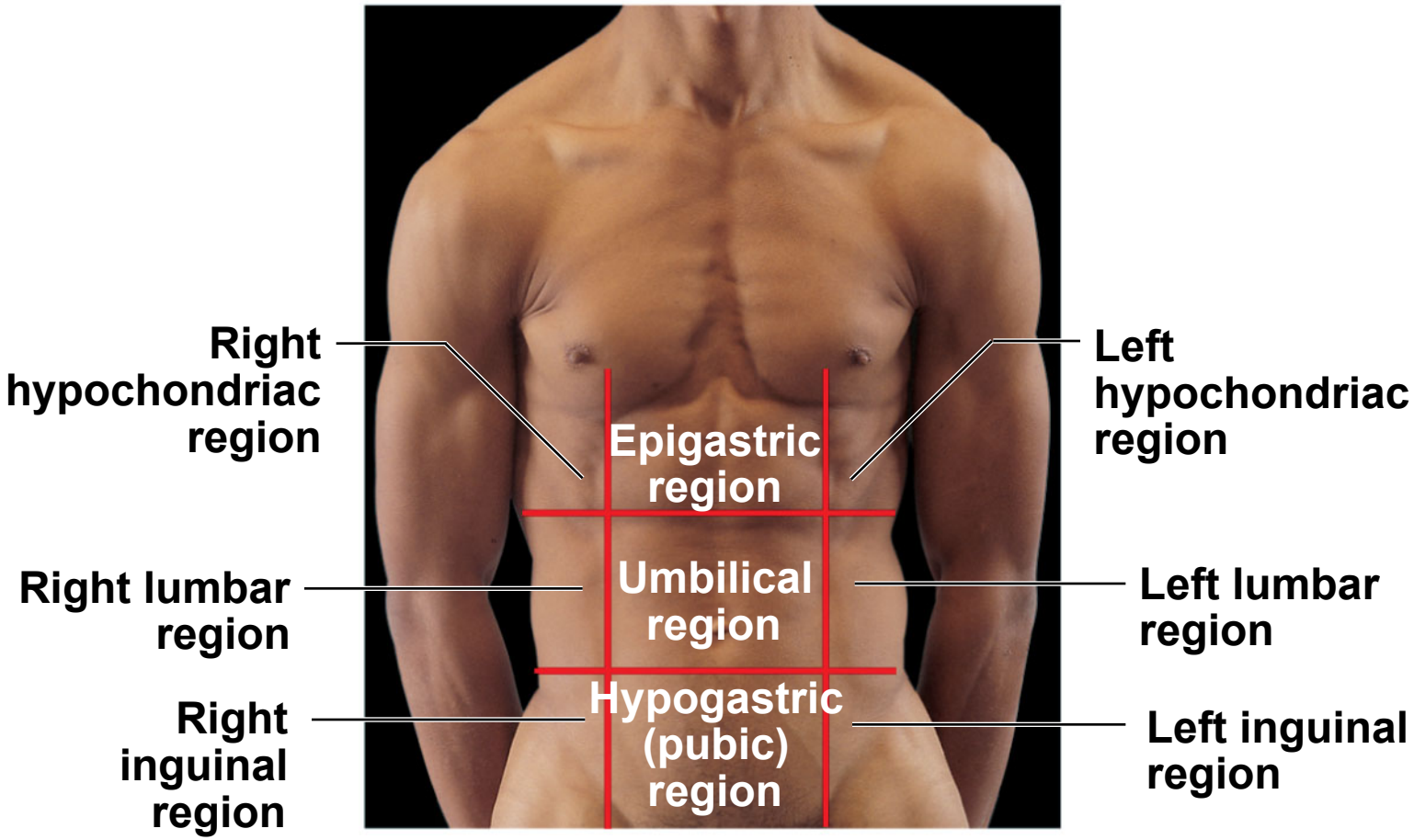
b Posterior view

Figure 1-6a Abdominopelvic Quadrants and Regions



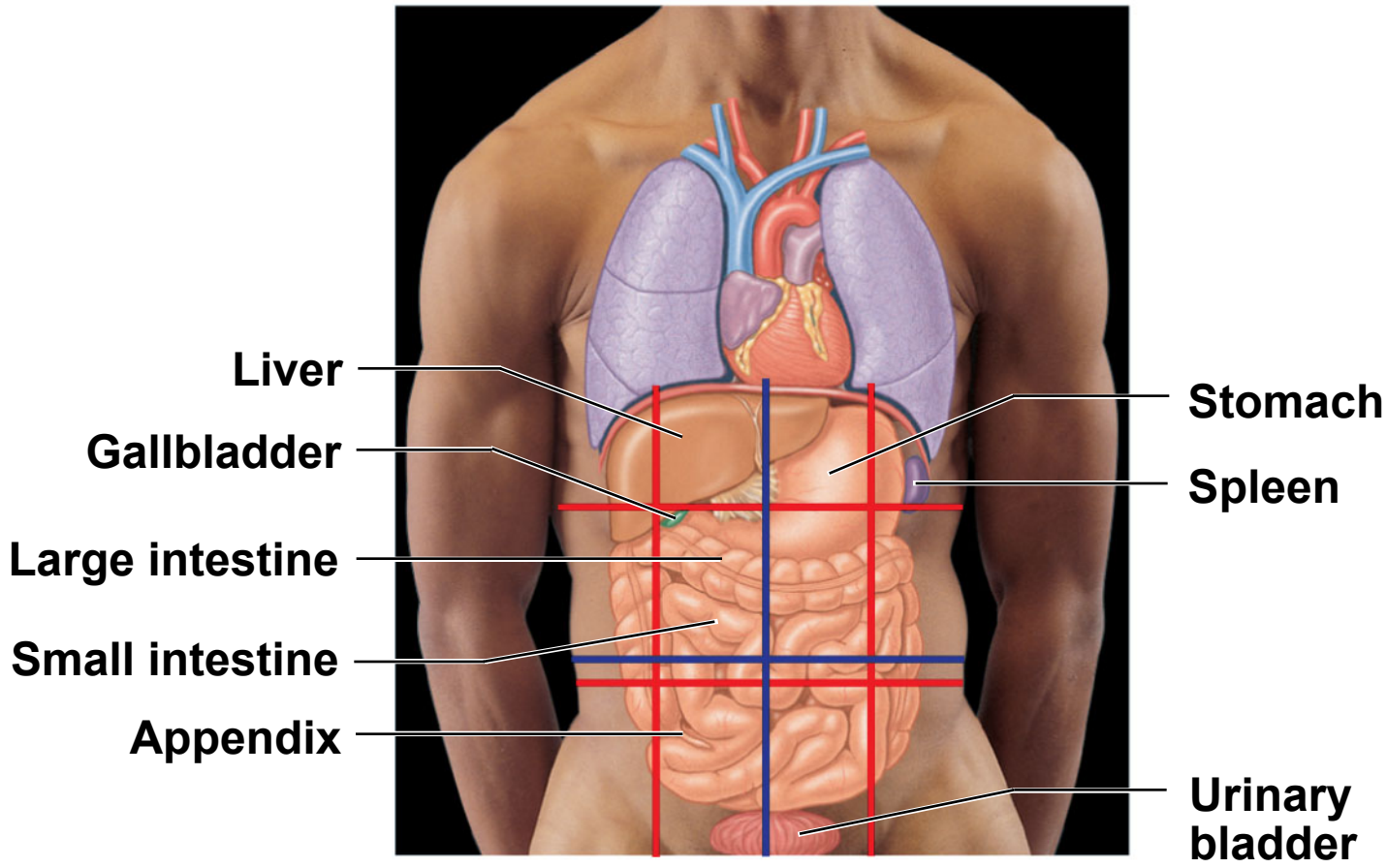
a Abdominopelvic quadrants. The four abdominopelvic quadrants are formed by two perpendicular lines that intersect at the navel. The terms for these quadrants, or their abbreviations, are most often used in clinical discussions.

Figure 1-6b Abdominopelvic Quadrants and Regions



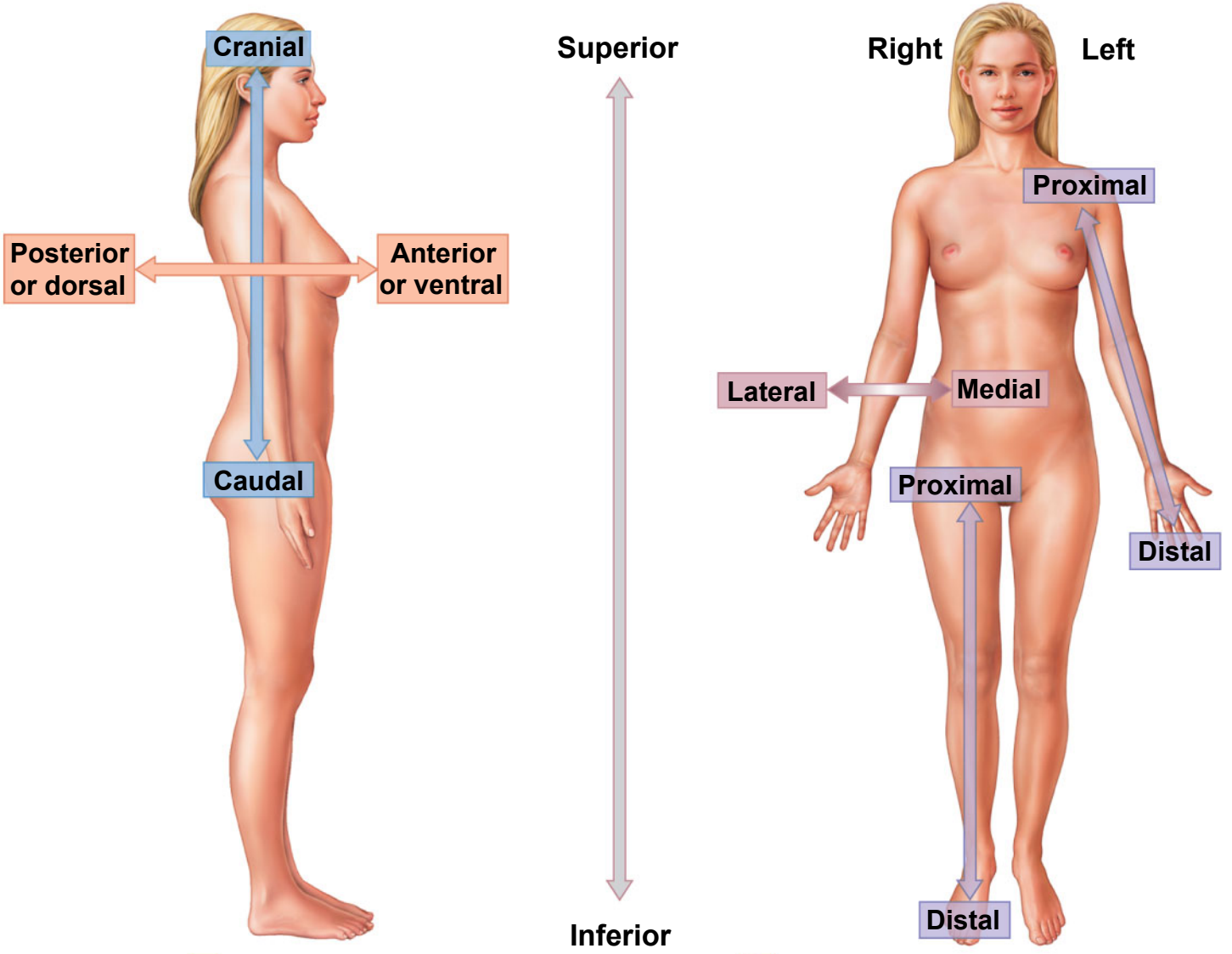
b Abdominopelvic regions. The nine abdominopelvic regions provide more precise regional descriptions.

Figure 1-6c Abdominopelvic Quadrants and Regions



c **Anatomical relationships. The relationship between the abdominopelvic quadrants and regions and the locations of the internal organs are shown here.**

Figure 1-7 Directional References



a A lateral view.

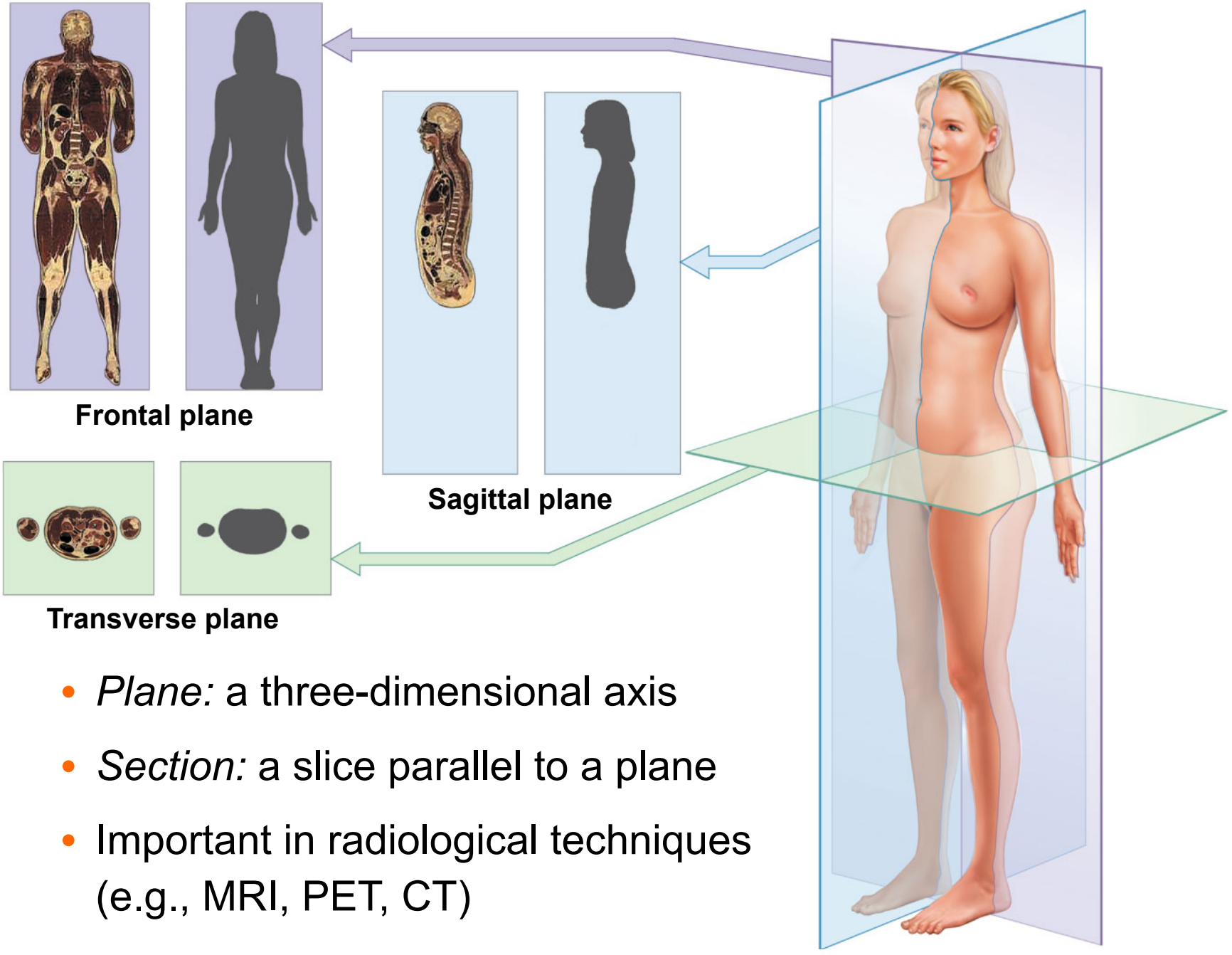
b An anterior view. Arrows indicate important directional terms used in this text; definitions and descriptions are given in Table 1-2.

Table 1-2 Directional Terms

Table 1–2 Directional Terms

Term	Region or Reference	Example
Anterior	The front surface	The navel is on the *anterior* surface of the trunk.
Ventral	The belly side (equivalent to anterior when referring to human body)	The navel is on the *ventral* surface of the trunk.
Posterior or **dorsal**	The back surface	The shoulder blade is located *posterior* to the rib cage.
Cranial or **cephalic**	The head	The *cranial*, or *cephalic*, border of the pelvis is on the side toward the head rather than toward the thigh.
Superior	Above; at a higher level (in the human body, toward the head)	In humans, the cranial border of the pelvis is *superior* to the thigh.
Caudal	The tail (coccyx in humans)	The hips are *caudal* to the waist.
Inferior	Below; at a lower level	The knees are *inferior* to the hips.
Medial	Toward the body's longitudinal axis; toward the midsagittal plane	The *medial* surfaces of the thighs may be in contact; moving medially from the arm across the chest surface brings you to the sternum.
Lateral	Away from the body's longitudinal axis; away from the midsagittal plane	The thigh articulates with the *lateral* surface of the pelvis; moving laterally from the nose brings you to the cheeks.
Proximal	Toward an attached base	The thigh is *proximal* to the foot; moving proximally from the wrist brings you to the elbow.
Distal	Away from an attached base	The fingers are *distal* to the wrist; moving distally from the elbow brings you to the wrist.
Superficial	At, near, or relatively close to the body surface	The skin is *superficial* to underlying structures.
Deep	Farther from the body surface	The bone of the thigh is *deep* to the surrounding skeletal muscles.

Figure 1-8 Sectional Planes



- *Plane:* a three-dimensional axis
- *Section:* a slice parallel to a plane
- Important in radiological techniques (e.g., MRI, PET, CT)

Table 1-3 Terms That Indicate Sectional Planes

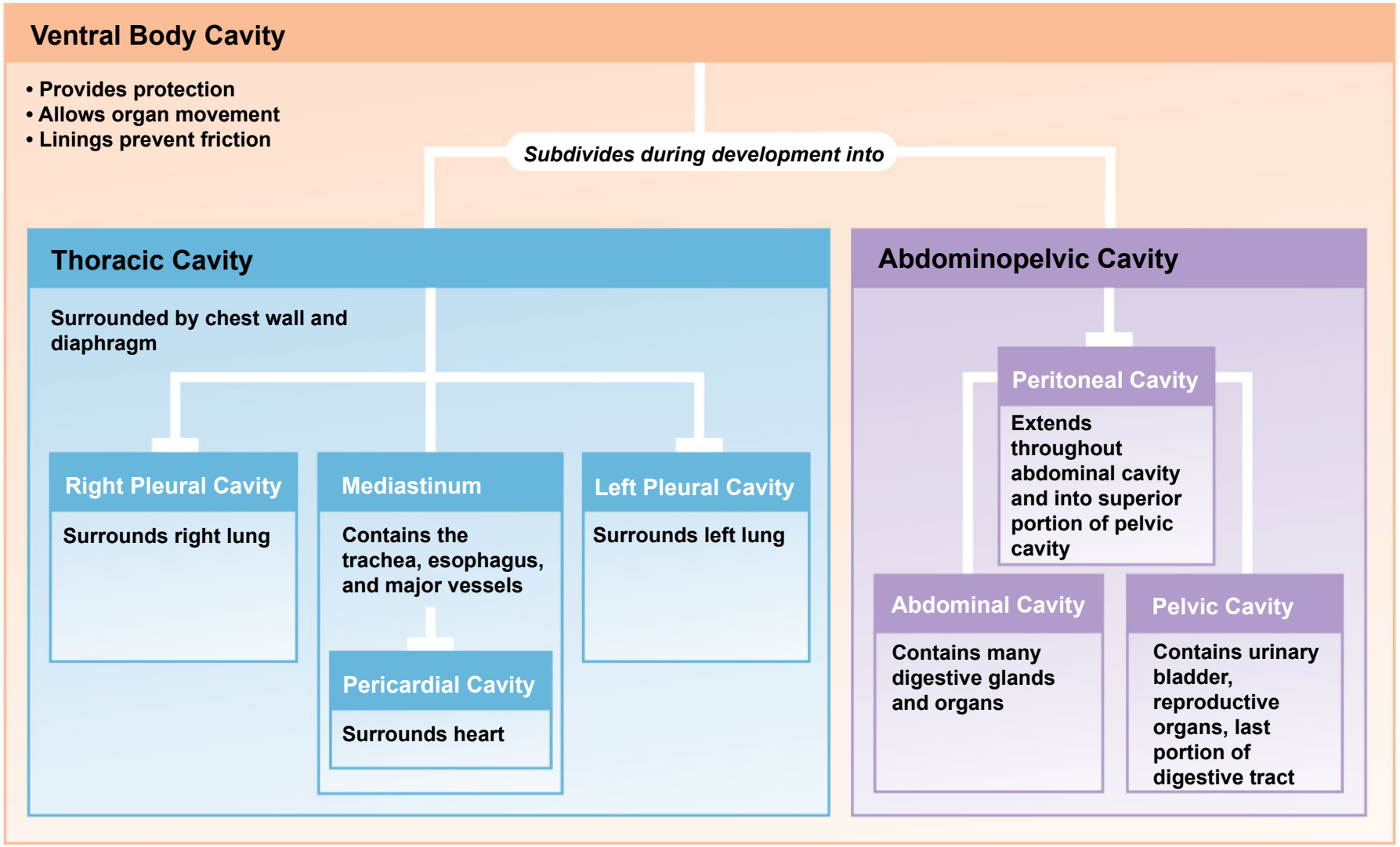
Table 1–3 Terms That Indicate Sectional Planes

Plane	Orientation of Plane	Directional Reference	Description
Transverse or **horizontal**	Perpendicular to long axis	Transversely or horizontally	A *transverse*, or *horizontal*, *section* separates superior and inferior portions of the body. A cut in this plane is called a *cross section.*
Sagittal	Parallel to long axis	Sagittally	A *sagittal section* separates right and left portions. You examine a sagittal section, but you section sagittally.
Midsagittal			In a *midsagittal section* or *median section*, the plane passes through the midline, dividing the body into right and left sides.
Parasagittal			A *parasagittal section*, which is a cut parallel to the midsagittal plane, separates the body into right and left portions of unequal size.
Frontal or **coronal**		Frontally or coronally	A *frontal*, or *coronal*, *section* separates anterior and posterior portions of the body; coronal usually refers to sections passing through the skull.

1-9 Body Cavities

- Essential Functions of **Body Cavities**
  1. Protect organs from accidental shocks
  2. Permit changes in size and shape of internal organs
- *Ventral body cavity* (*coelom*)
  - Divided by the **diaphragm**
    - **Thoracic cavity**
    - **Abdominopelvic cavity**

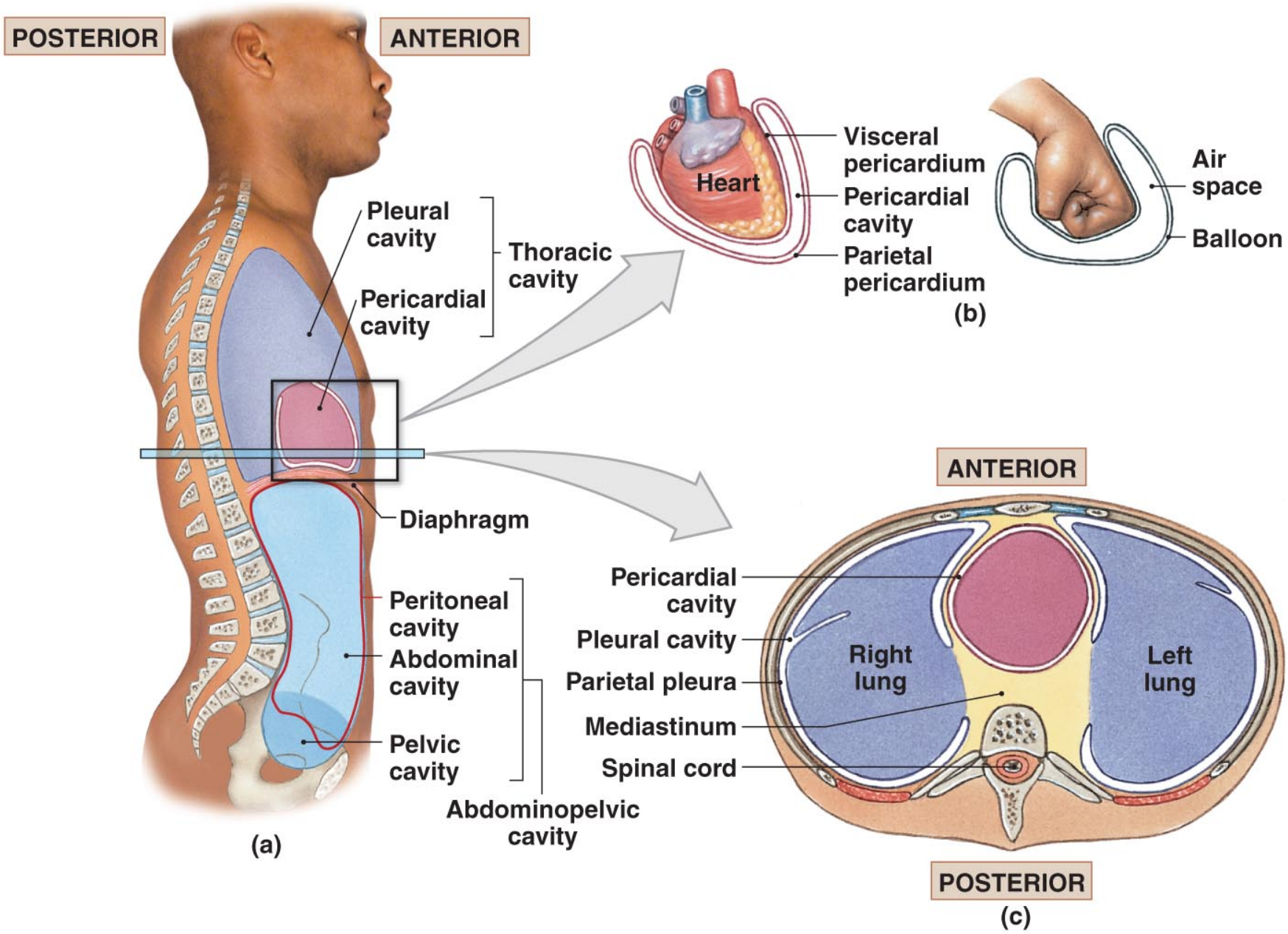
Figure 1-9 Relationships among the Subdivisions of the Ventral Body Cavity



1-9 Body Cavities

- ***Serous Membranes***
  - Line body cavities and cover organs
  - Consist of ***parietal layer*** and ***visceral layer***
    - Parietal layer — lines cavity
    - Visceral layer — covers organs
      - For example within the Abdominopelvic Cavity:
        - Peritoneal cavity — chamber within abdominopelvic cavity
        - *Parietal peritoneum* lines the internal body wall
        - *Visceral peritoneum* covers the organs

Figure 1-10a The Ventral Body Cavity and Its Subdivisions



1-9 Body Cavities – Abdominopelvic Cavity

- **Abdominal cavity** — superior portion
  - Diaphragm to top of pelvic bones
  - Contains digestive organs
  - *Retroperitoneal* space
    - Area posterior to *peritoneum* and anterior to muscular body wall
    - Contains pancreas, kidneys, ureters, and parts of the digestive tract
- **Pelvic cavity** — inferior portion
  - Within pelvic bones
  - Contains reproductive organs, rectum and bladder

Chapter 1 Objective Summary Review

- Be able to name the various specialties of anatomy and physiology.
- Be able to name the major levels of organization in organisms, from molecular to organisms.
- Be familiar with the 11 organ systems of the body and their major components. (*MURDERS LINC*)
- Be able to explain the concept of homeostasis, including both positive and negative feedback.
- Be able to identify the major body cavities using proper anatomical terms.