Introduction to Anatomy and Physiology

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Overview of Anatomy and Physiology

- Anatomy – the study of the structure of body parts and their relationships to one another
  - Gross or macroscopic
  - Microscopic
- Physiology – the study of the function of the body's structural machinery
- Pathology – the study of disease
- Pathophysiology – the study of disorders of function

Gross Anatomy

- Regional – all structures in one part of the body (such as the abdomen or leg)
- Systemic – gross anatomy of the body studied by system
- Surface – study of internal structures as they relate to the overlying skin

Microscopic Anatomy

- Cytology – study of the cell
- Histology – study of tissues

Levels of Structural Organization

- Chemical – atoms combined to form molecules
- Cellular – cells are made of molecules
- Tissue – consists of similar types of cells
- Organ – made up of different types of tissues
- Organ system – consists of different organs that work closely together
- Organism – made up of the organ systems

Homeostasis

- Homeostasis is the ability to maintain a relatively stable internal environment in an ever-changing outside world
- The internal environment of the body is in a dynamic state of equilibrium
- Chemical, thermal, and neural factors interact to maintain homeostasis

Homeostatic Control Mechanisms

- The variable produces a change in the body
- The three interdependent components of control mechanisms are:
  - Receptor – monitors the environments and responds to changes (stimuli)
  - Control center – determines the set point at which the variable is maintained
  - Effector – provides the means to respond to the stimulus
- Negative Feedback
  - In negative feedback systems, the output shuts off the original stimulus
  - If the receptors measure deviations from a set point, effectors are activated to return things to normal

    - Examples
        - Thermostatic controls of body
        - Regulation of blood glucose levels
- Positive Feedback
    - In positive feedback systems, the output enhances or exaggerates the original stimulus
    - Example: Regulation of blood clotting
    - Positive Feedback Loops
        - Normal way of producing rapid changes occurs with childbirth, blood clotting, protein digestion, fever, and generation of nerve signals

Homeostatic Imbalance

- Disturbance of homeostasis or the body's normal equilibrium
- Overwhelming of negative feedback mechanisms allowing destructive positive feedback mechanisms to take over
    - Disease = Dis ease

Anatomical Position

- Body erect, feet slightly apart, palms facing forward, thumbs point away from body

TABLE 1.1 Orientation and Directional Terms

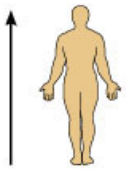
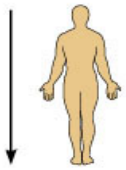
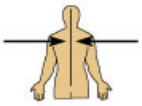
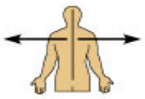
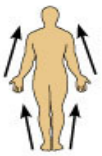
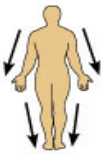
Term	Definition	Example	
Superior (cranial)	Toward the head end or upper part of a structure or the body; above		The head is superior to the abdomen
Inferior (caudal)	Away from the head end or toward the lower part of a structure or the body; below		The navel is inferior to the chin
Anterior (ventral)*	Toward or at the front of the body; in front of		The breastbone is anterior to the spine
Posterior (dorsal)*	Toward or at the back of the body; behind		The heart is posterior to the breastbone
Medial	Toward or at the midline of the body; on the inner side of		The heart is medial to the arm

TABLE 1.1 Orientation and Directional Terms

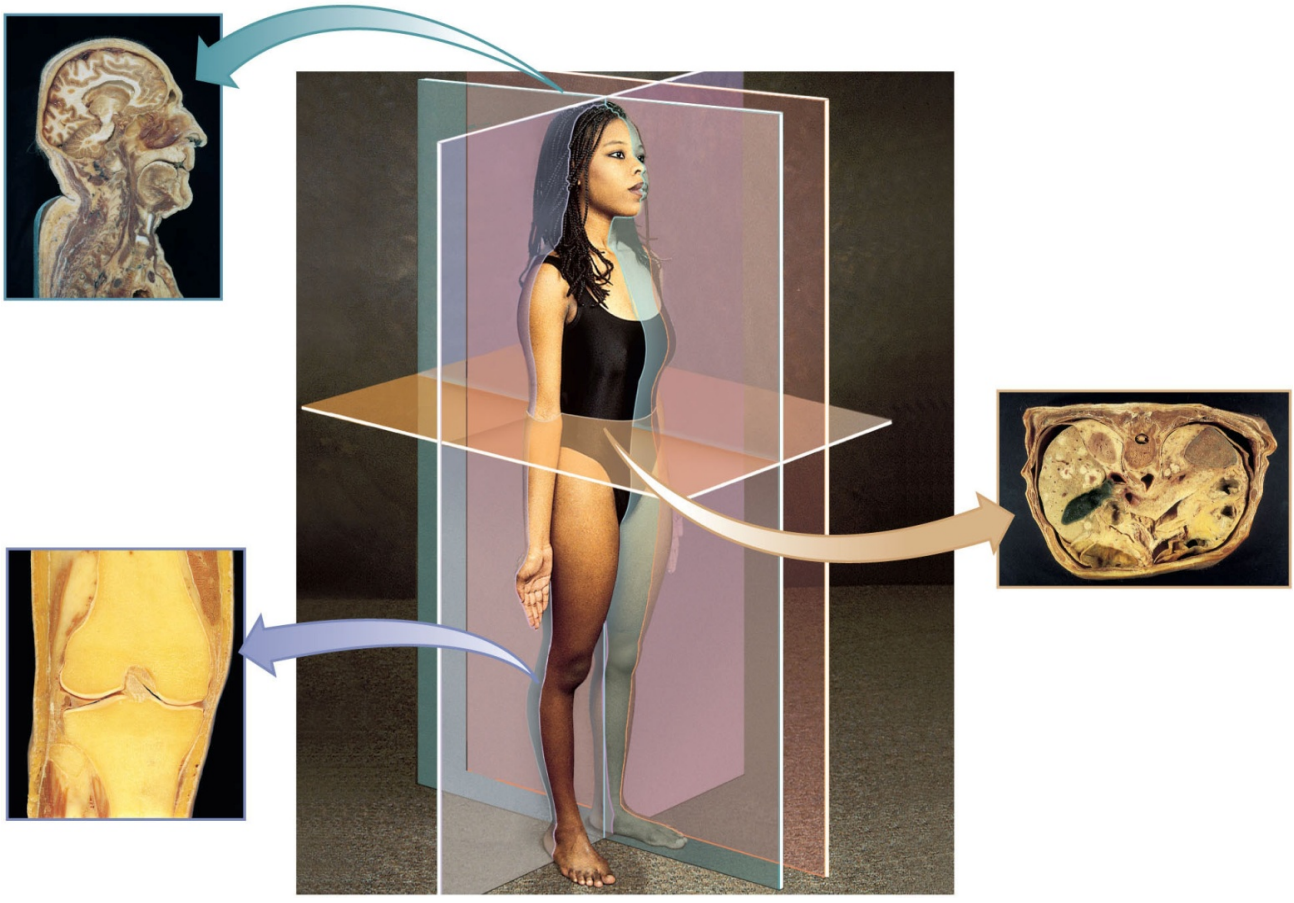
Term	Definition	Example	
Lateral	Away from the midline of the body; on the outer side of		The arms are lateral to the chest
Intermediate	Between a more medial and a more lateral structure		The collarbone is intermediate between the beastbone and shoulder
Proximal	Closer to the origin of the body part or the point of attachment of a limb to the body trunk		The elbow is proximal to the wrist
Distal	Farther from the origin of a body part or the point of attachment of a limb to the body trunk		The knee is distal to the thigh
Superficial (external)	Toward or at the body surface		The skin is superficial to the skeletal muscles
Deep (internal)	Away from the body surface; more internal		The lungs are deep to the skin

Regional Terms

- Axial – head, neck, and trunk
- Appendicular – appendages or limbs
- Specific regional terminology

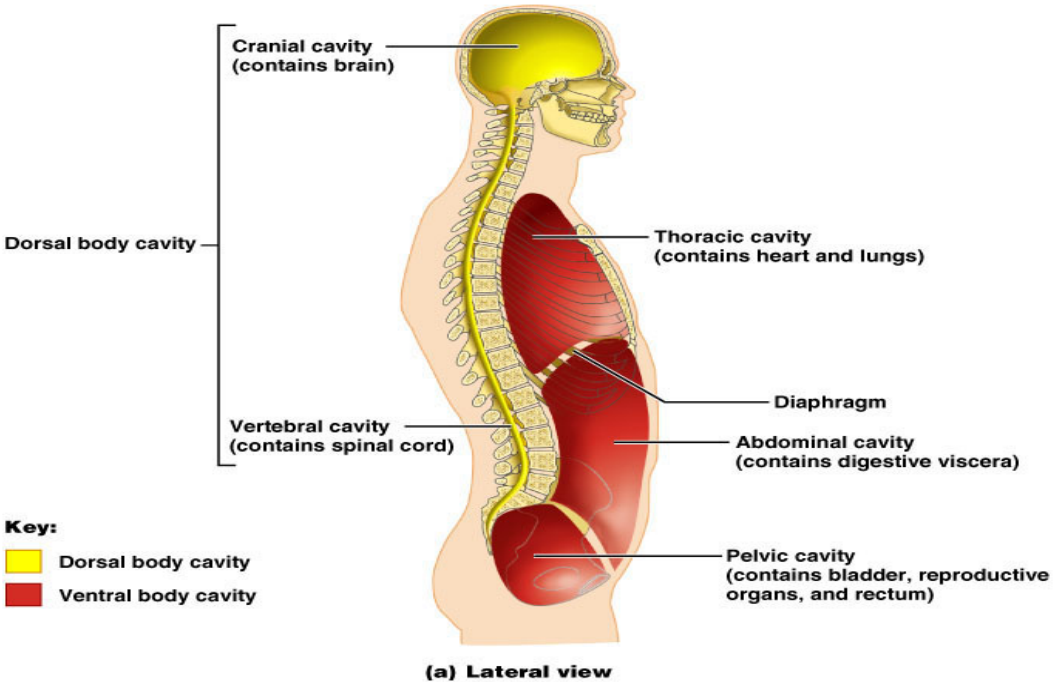
Body Planes

- Sagittal – divides the body into right and left parts
- Midsagittal or medial – sagittal plane that lies on the midline
- Frontal or coronal – divides the body into anterior and posterior parts
- Transverse or horizontal (cross section) – divides the body into superior and inferior parts
- Oblique section – cuts made diagonally

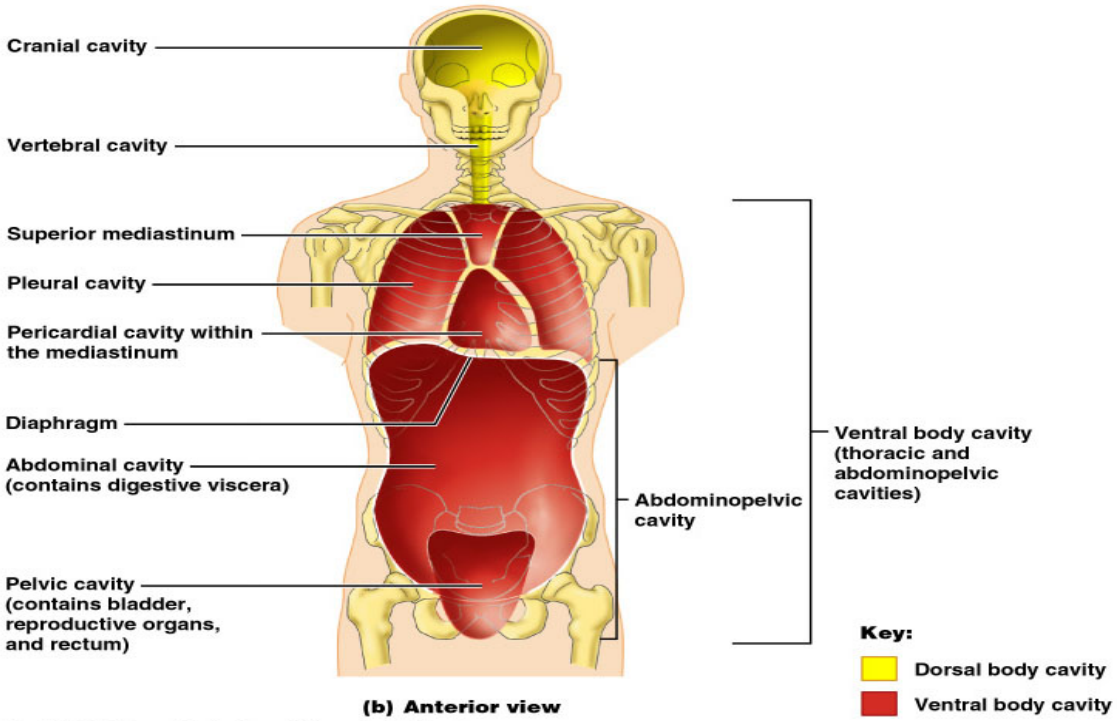


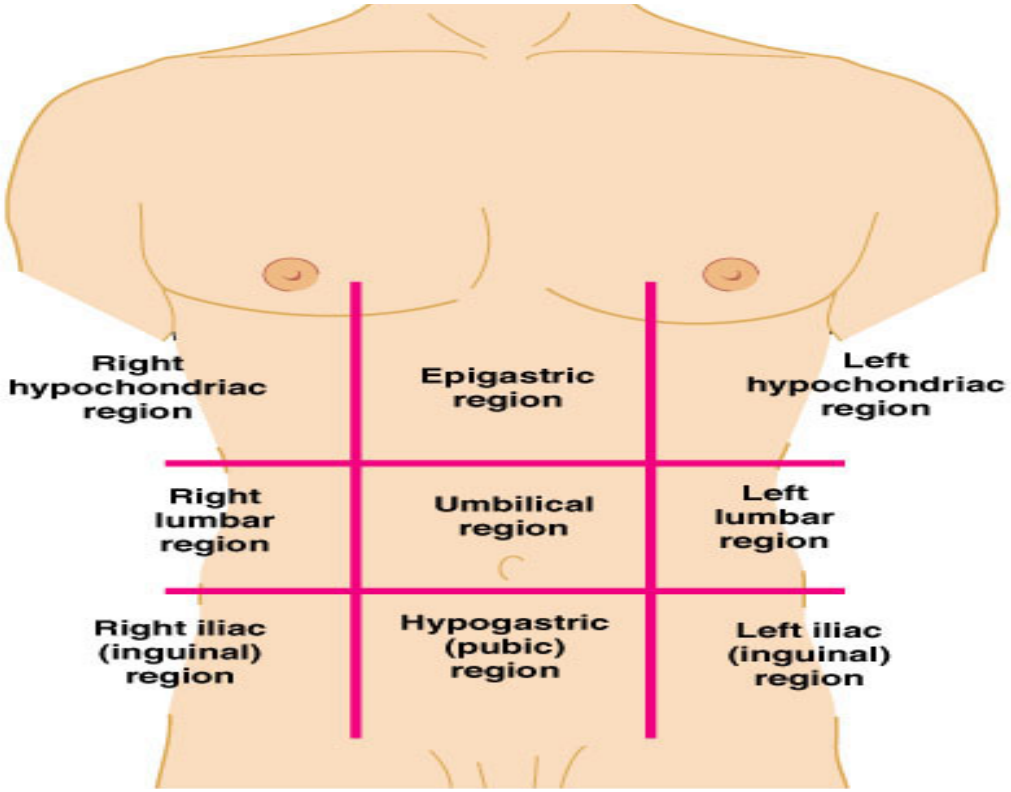
Body Cavities

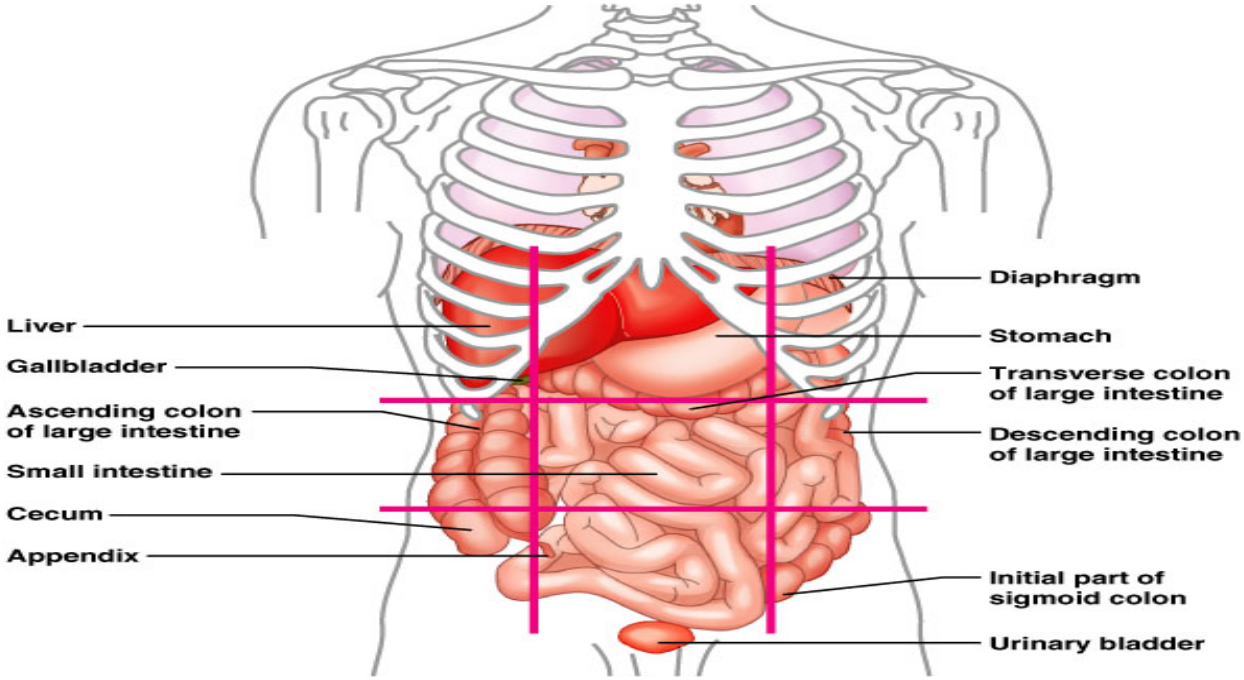
- Dorsal cavity protects the nervous system, and is divided into two subdivisions
  - Cranial cavity is within the skull and encases the brain
  - Vertebral cavity runs within the vertebral column and encases the spinal cord
- Ventral cavity houses the internal organs (viscera), and is divided into two subdivisions: thoracic and abdominopelvic
  - Thoracic cavity is subdivided into pleural cavities, the mediastinum, and the pericardial cavity
    - Pleural cavities – each houses a lung
    - Mediastinum – contains the pericardial cavity, and surrounds the remaining thoracic organs
    - Pericardial cavity – encloses the heart
  - The abdominopelvic cavity is separated from the superior thoracic cavity by the dome-shaped diaphragm - It is composed of two subdivisions
    - Abdominal cavity – contains the stomach, intestines, spleen, liver, and other organs
    - Pelvic cavity – lies within the pelvis and contains the bladder, reproductive organs, and rectum
- Other Body Cavities
  - Oral and digestive – mouth and cavities of the digestive organs
  - Nasal –located within and posterior to the nose
  - Orbital – house the eyes
  - Middle ear – contain bones (ossicles) that transmit sound vibrations
  - Synovial – joint cavities

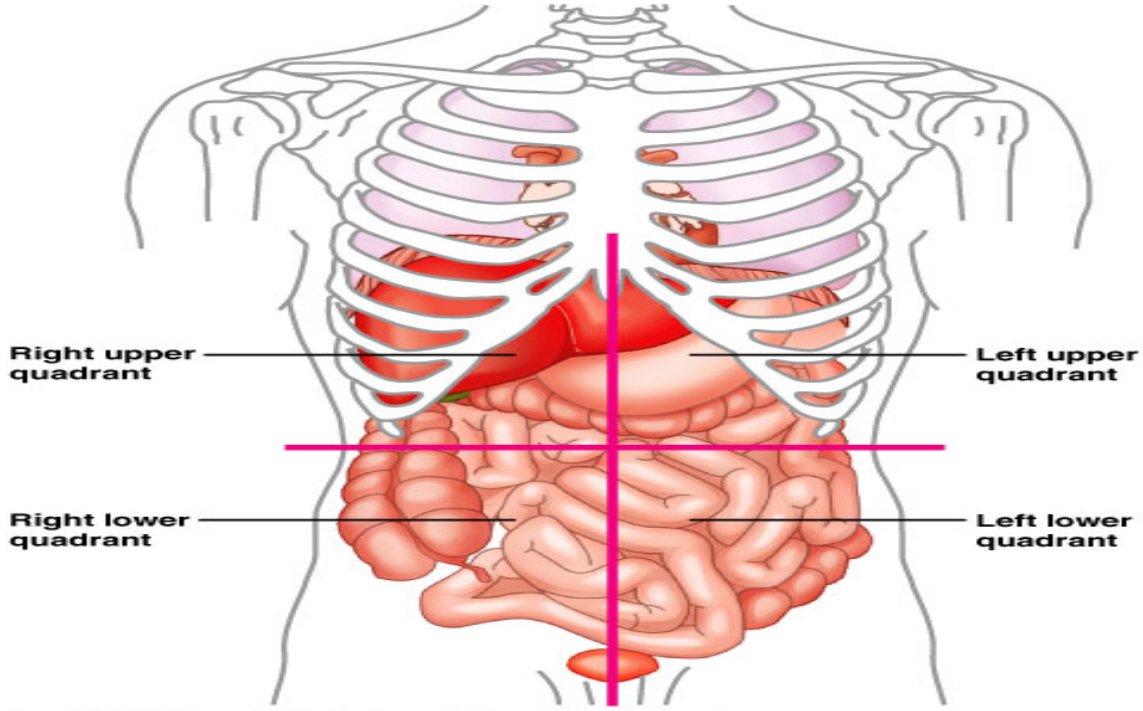


(a) Lateral view


Cranial cavity
Vertebral cavity
Superior mediastinum
Pleural cavity
Pericardial cavity within the mediastinum
Diaphragm
Abdominal cavity (contains digestive viscera)
Pelvic cavity (contains bladder, reproductive organs, and rectum)
Abdominopelvic cavity
Ventral body cavity (thoracic and abdominopelvic cavities)
Key:
Dorsal body cavity
Ventral body cavity
(b) Anterior view


Right hypochondriac region
Epigastric region
Left hypochondriac region
Right lumbar region
Umbilical region
Left lumbar region
Right iliac (inguinal) region
Hypogastric (pubic) region
Left iliac (inguinal) region


Diaphragm
Liver
Stomach
Gallbladder
Transverse colon of large intestine
Ascending colon of large intestine
Descending colon of large intestine
Small intestine
Cecum
Appendix
Initial part of sigmoid colon
Urinary bladder


Right upper quadrant
Left upper quadrant
Right lower quadrant
Left lower quadrant