ANATOMIC PLANES & SECTIONS

CN: (1) Use your lightest colors on A–D. (2) Color a body plane in the center diagram; then color its title, related sectional view, and the sectioned body example. (3) Color everything within the dark outlines of the sectional views.

MEDIAN A

The median plane is the midline longitudinal plane dividing the head and torso into right and left halves. The presence of the sectioned midline of the vertebral column and spinal cord is characteristic of this plane. The median plane is the middle sagittal (mid-sagittal) plane.

SAGITTAL B

The sagittal plane is a longitudinal plane dividing the head and torso into left and right parts (not halves). It is parallel to the median (not medial) plane.

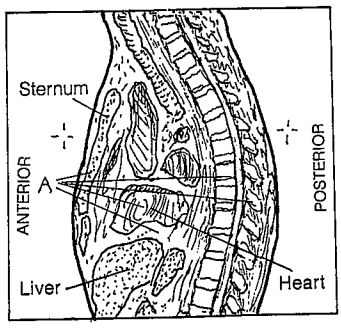
CORONAL, FRONTAL C

The coronal or frontal plane is a longitudinal plane dividing the body (head, torso, limbs) or its parts into front and back halves or parts.

TRANSVERSE, CROSS D

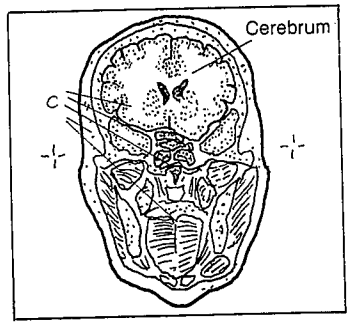
The transverse plane divides the body into upper and lower halves or parts (cross sectons). It is perpendicular to the longitudinal planes. Transverse planes may be horizontal planes of the upright body. Transverse planes are called "axial" or "transaxial" sections/slices by radiologists.

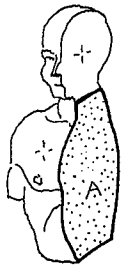
Study of the human body requires visualization of internal regions and parts. Dissection (dis, apart; sect-, cut) is the term given to preparing the body for internal inspection. One method of dissection permits consistent visual orientation by cutting the body into parts, called "sections," along the lines of reference, called "planes." The viewing and study of internal human structure in these planes is possible through medical imaging, such as computerized tomography (CT) and magnetic resonance imaging (MRI).

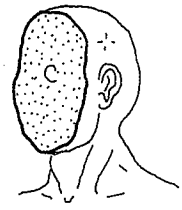


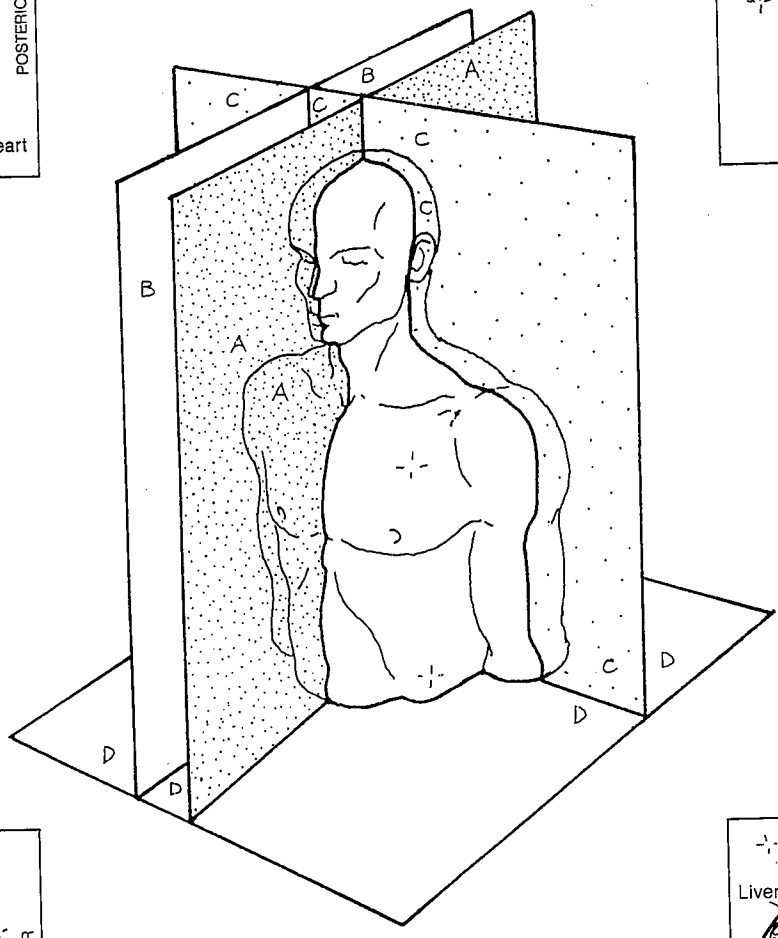
Median section through the thorax

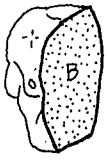
Coronal section through the head

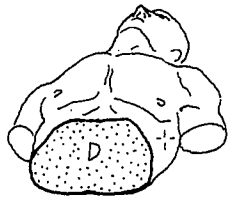


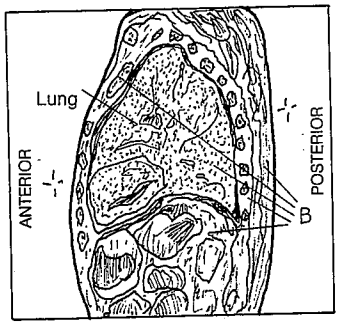






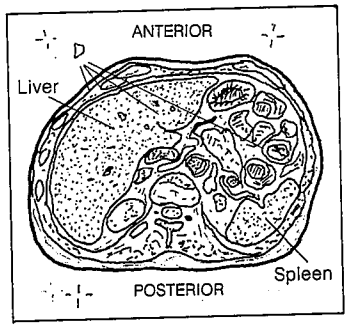






Sagittal section through the thorax

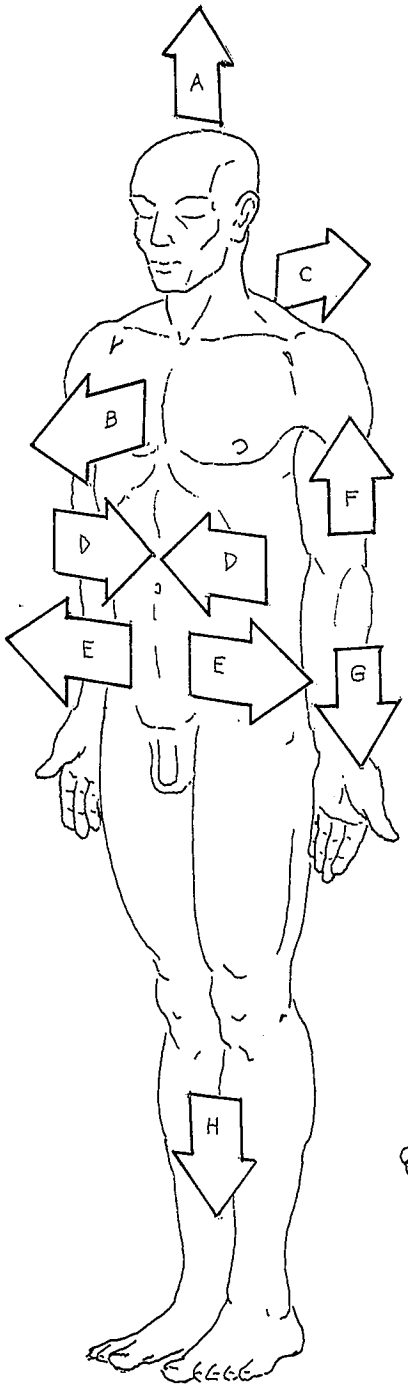
Cross section through the abdomen



TERMS OF POSITION & DIRECTION

CN: Color the arrows and titles, but not the illustrations.

Terms of position and direction describe the relationship of one organ to another, usually along one of the three body planes illustrated in the previous plate. To avoid confusion, these terms are related to the standard anatomical position: body standing erect, limbs extended, palms of the hands forward.



CRANIAL, SUPERIOR, ROSTRAL A

These terms refer to a structure being closer to the head or higher than another structure of the body. These terms are not used with respect to the limbs.

ANTERIOR, VENTRAL B

These terms refer to a structure being more in front than another structure in the body. The term "anterior" is preferred.

POSTERIOR, DORSAL C

These terms refer to a structure being more in back than another structure in the body. The term "posterior" is preferred.

MEDIAL D

This term refers to a structure that is closer to the median plane than another structure in the body. "Medial" is not synonymous with "median."

LATERAL E

This term refers to a structure that is further away from the median plane than another structure in the body.

PROXIMAL F

Employed only with reference to the limbs, this term refers to a structure being closer to the median plane or root of the limb than another structure in the limb.

DISTAL G

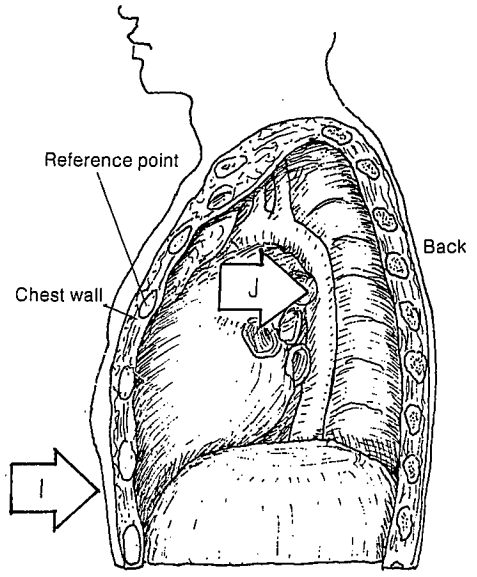
Employed only with reference to the limbs, this term refers to a structure being further away from the median plane or the root of the limb than another structure in the limb.

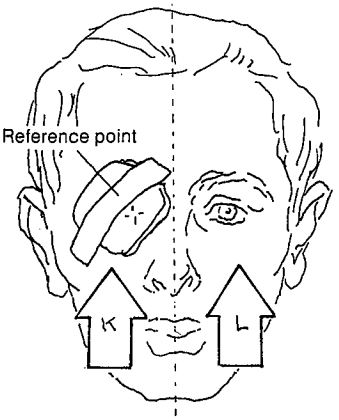
CAUDAL, INFERIOR H

These terms refer to a structure being closer to the feet or the lower part of the body than another structure in the body. These terms are not used with respect to the limbs.

SUPERFICIAL I DEEP J

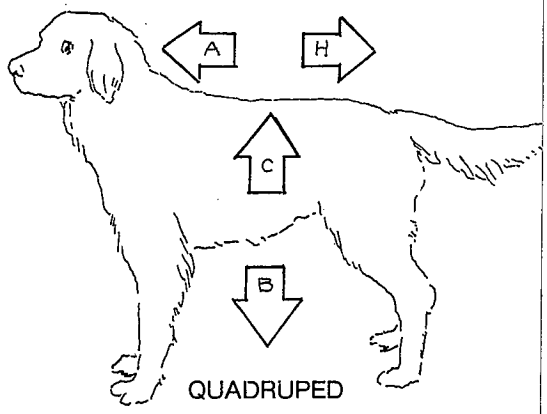
The term "superficial" is synonymous with external, the term "deep" with internal. Related to the reference point on the chest wall, a structure closer to the surface of the body is superficial; a structure further away from the surface is deep.





IPSILATERAL K CONTRALATERAL L

The term "ipsilateral" means "on the same side" (in this case, as the reference point); "contralateral" means "on the opposite side" (of the reference point).



QUADRUPED

The quadruped presents four points of direction: head end (cranial), tail end (caudal), belly side (ventral), back side (dorsal). In the biped (e.g., human), the ventral side is also anterior, the dorsal side is also posterior, the cranial end is also superior, and the caudal end is inferior.

SYSTEMS OF THE BODY (1)

CN: Use light colors. Color the skeleton (A). Color the musculature (B) brown. Color the major arteries and heart red (with darker outlines), veins blue (C). Color all lymphatic vessels (D) green. Color nerves, brain and spinal cord (E), yellow. Color the insets representing the endocrine system (F). Pick a skin color for the integumentary system (G). Note that the latter two are independent systems, but are graphically combined here in one body.

Collections of similar cells constitute tissues. The four basic tissues are integrated into body wall and visceral structures/organs. A *system* is a collection of organs and structures sharing a common function. Organs and structures of a single system occupy diverse regions in the body and are not necessarily grouped together.

SKELETAL A ARTICULAR A'

The skeletal system consists of the skeleton of bones and their periosteum, and the ligaments that secure the bones at joints. By extension, this system could include the varied fasciae that ensheath the body wall/skeletal muscles and contribute to the body's structural stability. The *articular system* comprises the joints, both movable and fixed, and the related structures, including joint capsules, synovial membranes, and discs/menisci.

MUSCULAR B

The muscular system includes the skeletal muscles that move the skeleton, the face, and other structures and give form to the body; the cardiac muscle of the heart walls; and the smooth muscle of the walls of viscera and vessels and in the skin.

CARDIOVASCULAR C

The cardiovascular system consists of the four-chambered heart, arteries conducting blood to the tissues, capillaries through which nutrients, gases, and molecular material pass to and from the tissues, and veins returning blood from the tissues to the heart. Broadly interpreted, the cardiovascular system includes the lymphatic system.

LYMPHATIC D

The lymphatic system is a system of vessels assisting the veins in recovering the body's tissue fluids and returning them to the heart. The body is about 60% water, and the veins alone are generally incapable of meeting the demands of tissue drainage. Lymph nodes, which filter lymph, are located throughout the body

NERVOUS E

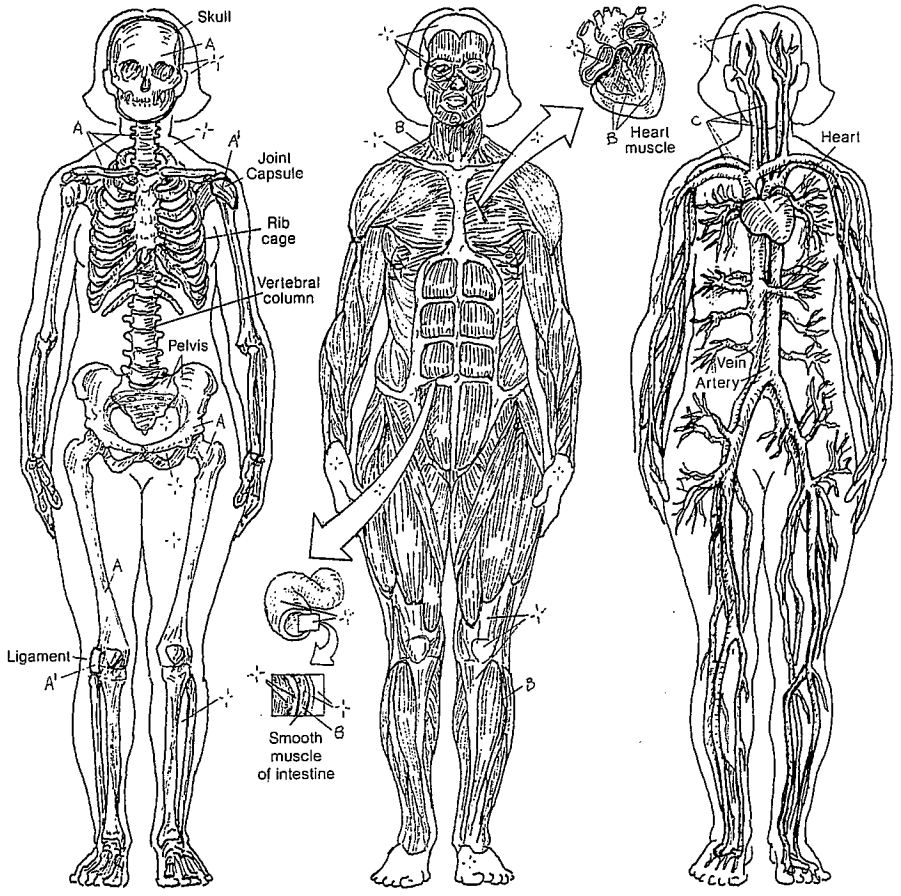
The nervous system consists of impulse-generating/conducting tissue organized into a central nervous system (brain and spinal cord) and a peripheral nervous system (nerves), which includes the visceral (autonomic) nervous system involved in involuntary "fight or flight" and vegetative responses.

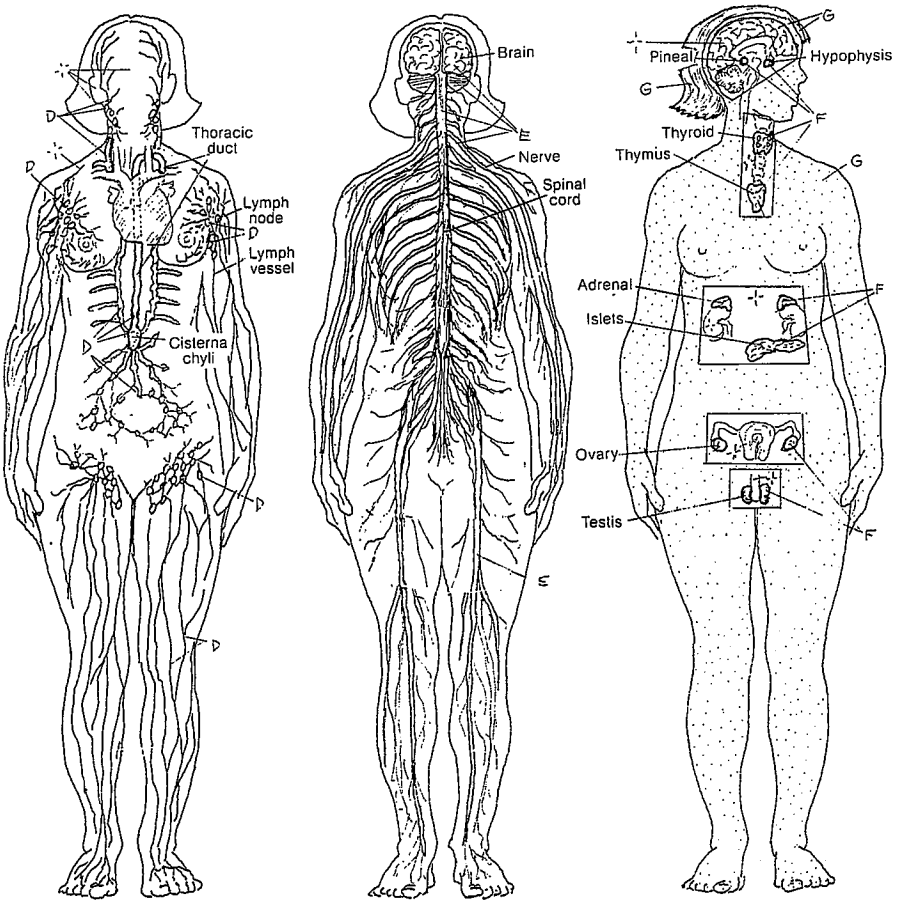
ENDOCRINE F

The endocrine system consists of glands that secrete chemical agents (hormones) into the tissue fluids and blood, affecting the function of multiple areas of the body. Many of these glands are under some control by the brain (hypothalamus). Hormones help maintain balanced metabolic functions in many of the body's systems.

INTEGUMENTARY G

The integumentary system is the skin, replete with glands, sensory receptors, vessels, immune cells and antibodies, and layers of cells and keratin that resist environmental factors harmful to the body.





SYSTEMS OF THE BODY (2)

CN: Use different light colors from those used on the preceding plate.

RESPIRATORY H

The respiratory system consists of the upper (nose through larynx) and lower respiratory tract (trachea through the air spaces of the lungs). Most of the tract is airway; only the air spaces (alveoli) and very small bronchioles exchange gases between alveoli and the lung capillaries.

DIGESTIVE I

The digestive system is concerned with the breakdown, digestion, and assimilation of food as well as excretion of the residua. Its tract begins with the mouth and continues down to the abdomen, wherein it takes a convoluted course to open again at the anus. Associated glands include the liver, the pancreas, and the biliary system (gall bladder and related ducts).

URINARY J

The urinary system is concerned with the conservation of water and maintenance of a neutral acid-base balance in the body fluids. The kidneys are the main functionaries of this system; residual fluid (urine) is excreted through ureters to the urinary bladder for retention and discharged to the outside through the urethra.

IMMUNE / LYMPHOID K

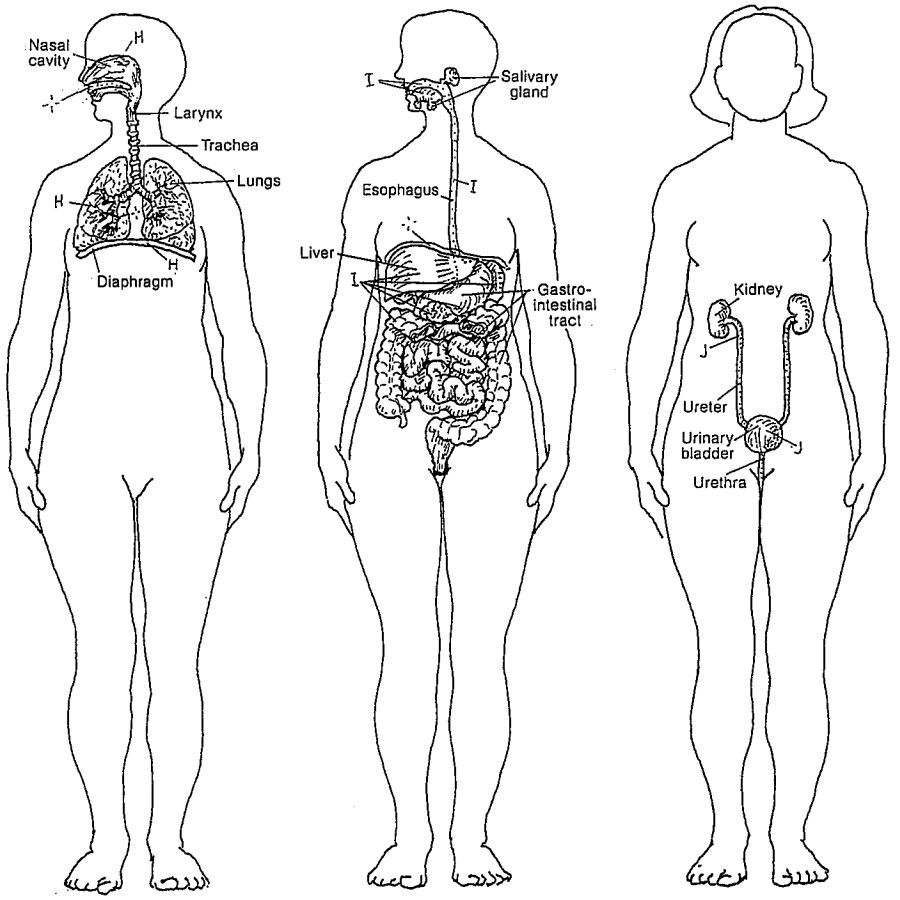
The lymphoid system consists of organs concerned with body defense: thymus, bone marrow, spleen, lymph nodes, tonsils, and smaller aggregates of lymphoid tissue. This system, including a diffuse arrangement of immune-related cells throughout the body, is concerned with resistance to invasive microorganisms and the removal of damaged or otherwise abnormal cells.

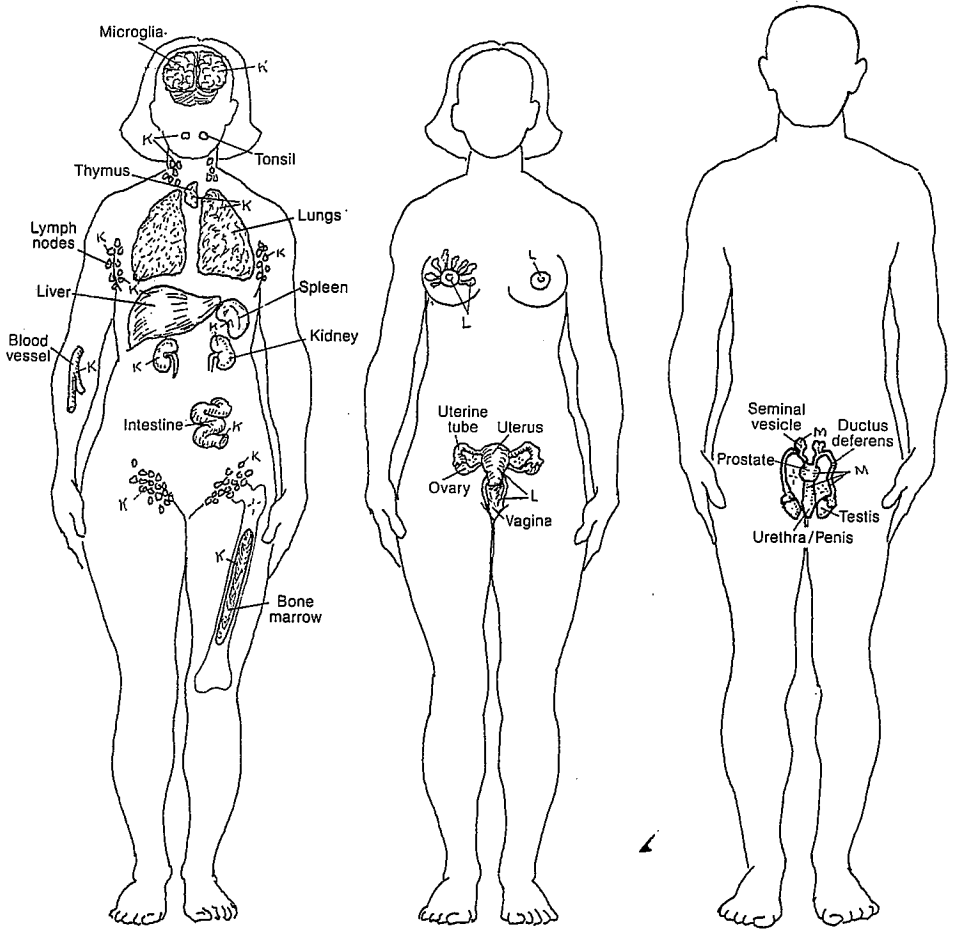
FEMALE REPRODUCTIVE L

The female reproductive system is concerned with the secretion of sex hormones, production and transportation of germ cells (ova), receipt and transport of male germ cells to the fertilization site, maintenance of the developing embryo/fetus, and initial sustenance of the newborn.

MALE REPRODUCTIVE M

The male reproductive system is concerned with the secretion of male sex hormones, formation and maintenance of germ cells (sperm), and transport of germ cells to the female genital tract.





REGIONS OF THE BODY (ANTERIOR)

CN: The text for this and the next plate is located on the next plate. (1) The anterior/lateral regions have been grouped according to larger areas: e.g., head, neck. The regions of each area (A^1, A^2, etc.) all receive a single color. Color a title and the arrow pointing to its region. (2) Although the title "pudendal" (D-) is to be colored, that region, consisting of the female external genitals, is not shown (N.S.). The same is true for the perineum (D-), that region between the pubis and the coccyx, below the pelvic floor.

HEAD A-
- FRONTAL A^1 (forehead)
- TEMPORAL A^2 (temple)
- ORBITAL A^3 (eye, cavity/walls)
- NASAL A^4 (nose, cavity/walls)
- BUCCAL A^5 (cheek)
- ORAL A^6 (mouth cavity)
- MANDIBULAR A^7 (lower jaw)

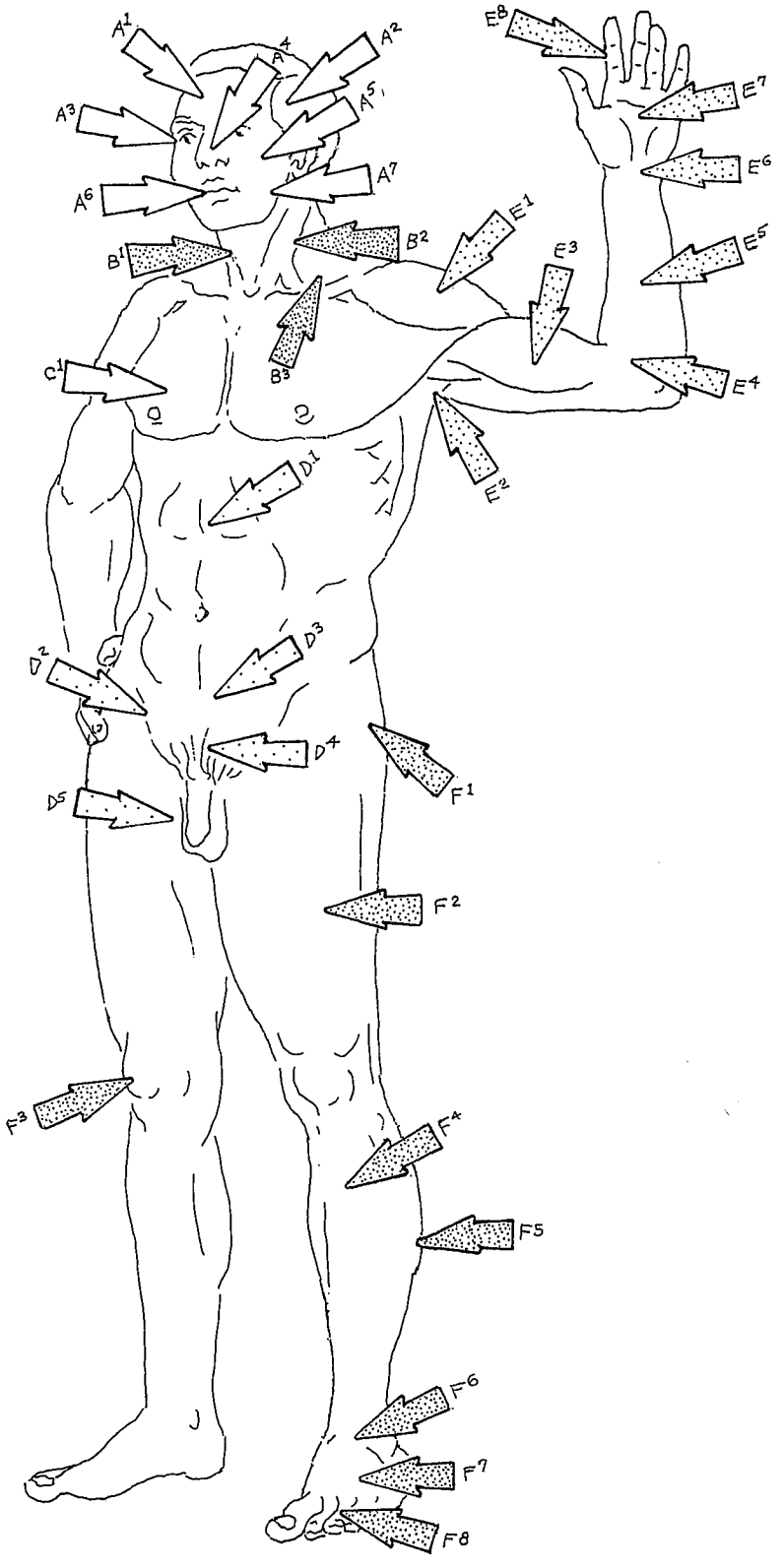
NECK B-
- ANTERIOR CERVICAL B^1 (front of neck)
- LATERAL CERVICAL B^2 (side of neck)
- SUPRACLAVICULAR B^3 (above clavicle)

THORAX C-
- PECTORAL C^1 (anterior chest)

ABDOMINOPELVIC D-
- ABDOMINAL D^1 (abdomen)
- INGUINAL D^2 (groin)
- PELVIC D^3 (pelvis)
- PUBIC D^4 (genital region)
- GENITAL D^5 (reproductive organs)
  - PUDENDAL D- N.S. (female genitals)
- PERINEAL D-N.S. (between pubis and coccyx)

UPPER LIMB E-
- DELTOID E^1 (shoulder/upper arm)
- AXILLARY E^2 (armpit)
- BRACHIAL E^3 (arm)
- ANTECUBITAL E^4 (front of elbow)
- ANTEBRACHIAL E^5 (forearm)
- CARPAL E^6 (wrist)
- HAND: PALMAR E^7 (palm)
- HAND: DIGITAL E^8 (fingers)

LOWER LIMB F-
- COXAL F^1 (hip)
- FEMORAL F^2 (thigh)
- PATELLAR F^3 (knee cap)
- CRURAL F^4 (leg)
  - FIBULAR F^5 (lateral leg)
- TARSAL F^6 (ankle)
- FOOT: DORSUM F^7 (top)
- FOOT: DIGITAL F^8 (toes)



REGIONS OF THE BODY (POSTERIOR)

CN: (1) Use the same colors for divisions marked A, B, E, and F that were used for those letters on the preceding plate.

Regional anatomy is the organization of human structure by regions. Here are shown the major regions within the principal areas of the body (e.g., head, neck). There are many regions within regions, each of which includes structures from different systems, such as bone, muscles, blood vessels, and nerves. Study of the body by dissection is generally accomplished region by region. An in-depth regional awareness of human structure is fundamental for most health care providers.

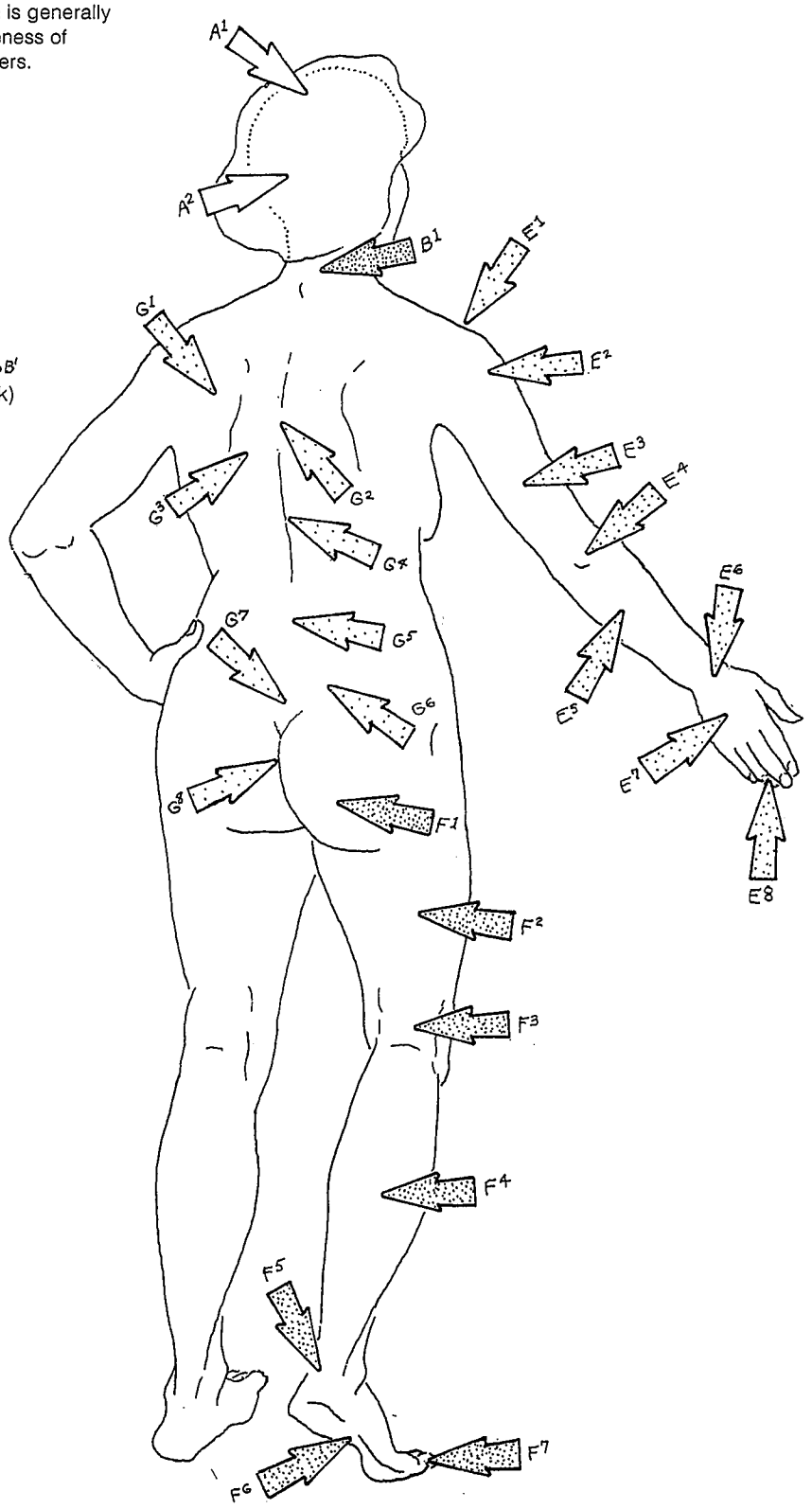
HEAD A-
- **PARIETAL** A^1 (top and sides of head)
- **OCCIPITAL** A^2 (back of head)

NECK B-
- **POST. CERVICAL / NUCHAL** B^1 (back of neck)

BACK G-
- **SCAPULAR** G^1 (shoulder blade)
- **VERTEBRAL** G^2 (spinal column)
- **PARASPINAL** G^3 (along side spinal column)
- **THORACIC** G^4 (posterior chest)
- **LUMBAR** G^5 (lower back)
- **SACROILIAC** G^6 (vertebro-pelvic joint)
- **SACRAL** G^7 (posterior pelvis)
- **COCCYGEAL** G^8 ("tail bone")

UPPER LIMB E-
- **ACROMIAL** E^1 (top of shoulder)
- **DELTOID** E^2 (shoulder/upper arm)
- **BRACHIAL** E^3 (arm)
- **CUBITAL** E^4 (elbow)
- **ANTEBRACHIAL** E^5 (forearm)
- **CARPAL** E^6 (wrist)
- **HAND: DORSAL** E^7 (back of hand)
- **HAND: DIGITAL** E^8 (fingers)

LOWER LIMB F-
- **GLUTEAL** F^1 (buttock)
- **FEMORAL** F^2 (thigh)
- **POPLITEAL** F^3 (back of knee)
- **CRURAL** F^4 (leg)
- **TARSAL** F^5 (ankle)
- **FOOT: PLANTAR** F^6 (sole)
- **FOOT: DIGITAL** F^7 (toes)



CAVITIES & LININGS

CN: Except for H, use light colors. (1) Note that the linings for closed body cavities (A1*–D1*) are to be colored gray. (2) In the open visceral cavities shown below, the linings receive the color (H).

CLOSED BODY CAVITIES -|-

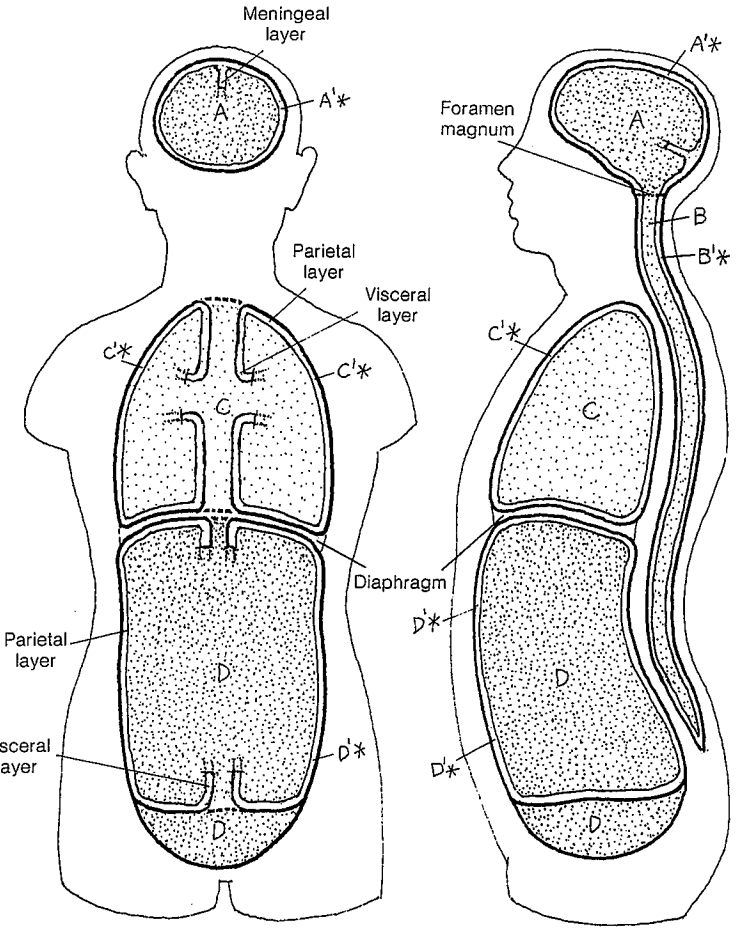
CRANIAL A DURA MATER A'*
VERTEBRAL B DURA MATER B'*
THORACIC C PLEURA C'*
ABDOMINOPELVIC D PERITONEUM D'*

Closed body cavities (The *cranial, vertebral, thoracic,* and *abdominopelvic* cavities) are not open to the outside of the body. Though organs may pass through them or exist in them, the organs' cavities do not open into these closed cavities. Closed body cavities are lined with a membrane: the thick *dura mater* in the skull and vertebral cavity, the thin, watery (serous) membranes (serosa) in the thoracic and abdominopelvic cavities.

The cranial cavity is occupied by the brain and its coverings, cranial nerves, and blood vessels. The bony walls of the cranial cavity are lined by the dura mater, a tough, fibrous membrane that turns inward to form a meningeal layer that envelops the brain (Plate 81). The vertebral cavity houses the spinal cord, its coverings, related vessels, and nerve roots (Plate 77). Its dura mater is continuous with the cranial dura at the foramen magnum, and it forms a sac whose bottom is at the level of the 2nd sacral vertebra.

The thoracic cavity contains the lungs, heart, and other structures (tubular airways, blood vessels, lymphatics, nerves) in the chest. Its skeletal walls are the thoracic vertebrae and ribs posteriorly, the ribs anterolaterally, and the sternum and costal cartilages anteriorly (Plate 30). The roof of the cavity is membranous; the floor is the muscular thoracic diaphragm (Plate 50). The middle of the thoracic cavity has a partition filled with structure (e.g., heart), called the mediastinum (Plate 104). It separates the thoracic cavity into discrete left and right parts (not shown).The internal surface of each half of the thoracic cavity is completely lined with a serous membrane called pleura (Plate 133). The pleura, like all serous membranes, consists of a single layer of ells supported by a thin, vascular, connective tissue layer. These cells secrete a serous fluid that permits the pleura-lined lungs to move against the pleura-lined thoracic walls without friction.

The abdominal cavity, containing the gastrointestinal tract and related glands, the urinary tract, and great numbers of vessels and nerves, has muscular walls anterolaterally, the lower ribs and muscle laterally, and the lumbar vertebrae posteriorly. The roof of the abdominal cavity is the thoracic diaphragm. The abdominal and pelvic cavities are continuous with one another and share the muscular pelvic floor. The pelvic cavity, containing the urinary bladder, rectum, and reproductive organs, has muscular walls anteriorly, bony walls laterally, and the sacrum posteriorly. The internal surface of the abdominal wall is lined by a serous membrane, the peritoneum (Plate 140).The serous secretions enable the mobile abdominal viscera to slip and slide frictionlessly during movement. The peritoneum drapes over the pelvic viscera, does not envelop them, and does not reach the pelvic floor.



OPEN VISCERAL CAVITIES -|-

RESPIRATORY TRACT E
URINARY TRACT F
DIGESTIVE TRACT G
MUCOSA H

Open cavities (*respiratory, digestive, urinary* tracts) are largely tubular passageways lined with a mucus-secreting layer called a *mucosa.* The mucosa is the working tissue (secretion, absorption, protection) of open cavities; it is lined with epithelial cells, is supported by vascular connective tissue, and often incorporates a smooth muscle layer. Open cavities within the thoracic and abdominopelvic cavities are open to the outside of the body. Their mucosal lining is continuous with the skin at the ends of the tubular cavities (nose, mouth, perineum).