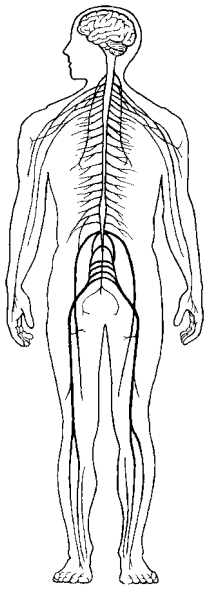
1 THE HUMAN BODY: AN ORIENTATION



Most of us have a natural curiosity about our bodies, and a study of anatomy and physiology elaborates on this interest. Anatomists have developed a universally acceptable set of reference terms that allows body structures to be located and identified with a high degree of clarity. Initially, students might have difficulties with the language used to describe anatomy and physiology, but without such a special vocabulary, confusion is bound to occur.

The topics in this chapter enable students to test their mastery of terminology commonly used to describe the body and its various parts, and concepts concerning functions vital for life and homeostasis. Body organization from simple to complex levels and an introduction to the organ systems forming the body as a whole are also covered.

AN OVERVIEW OF ANATOMY AND PHYSIOLOGY

1. Match the terms in Column B to the appropriate descriptions provided in Column A. Enter the correct letter or its corresponding term in the answer blanks.

Column A

_____ 1. The branch of biological science that studies and describes how body parts work or function

_____ 2. The study of the shape and structure of body parts

_____ 3. The tendency of the body's systems to maintain a relatively constant or balanced internal environment

_____ 4. The term that indicates *all* chemical reactions occurring in the body

Column B

A. Anatomy

B. Homeostasis

C. Metabolism

D. Physiology

2. Use a highlighter to identify the terms or phrases that correctly relate to the study of *physiology*. Use a different color highlighter to identify those terms or phrases that relate to the study of *anatomy*. Color the coding circles.

◯ Physiology ◯ Anatomy

A. Measuring an organ's size, shape, and weight
B. Can be studied in dead specimens
C. Often studied in living subjects
D. Chemistry principles
E. Measuring the acid content of the stomach
F. Principles of physics
G. Observing a heart in action
H. Dynamic
I. Dissection
J. Experimentation
K. Observation
L. Directional terms
M. Static

LEVELS OF STRUCTURAL ORGANIZATION

3. The structures of the body are organized into successively larger and more complex structures. Fill in the answer blanks with the correct terms for these increasingly larger structures.

Chemicals → _____ → _____ →

_____ → _____ → Organism

4. Circle the term that does not belong in each of the following groupings. Then, fill in the answer blanks with the correct group name. Follow the example below.

E.g. Atom Cell Tissue (Alive) Organ **Group:** Levels of structural organization

1. Brain Stomach Heart Liver Epithelium **Group:** _____
2. Epithelium Heart Muscle tissue Nervous tissue Connective tissue **Group:** _____
3. Human Digestive system Horse Pine tree Amoeba **Group:** _____

5. Using the key choices, complete the crossword puzzle by naming the organ system that correctly answers each of the clues provided.

Key Choices

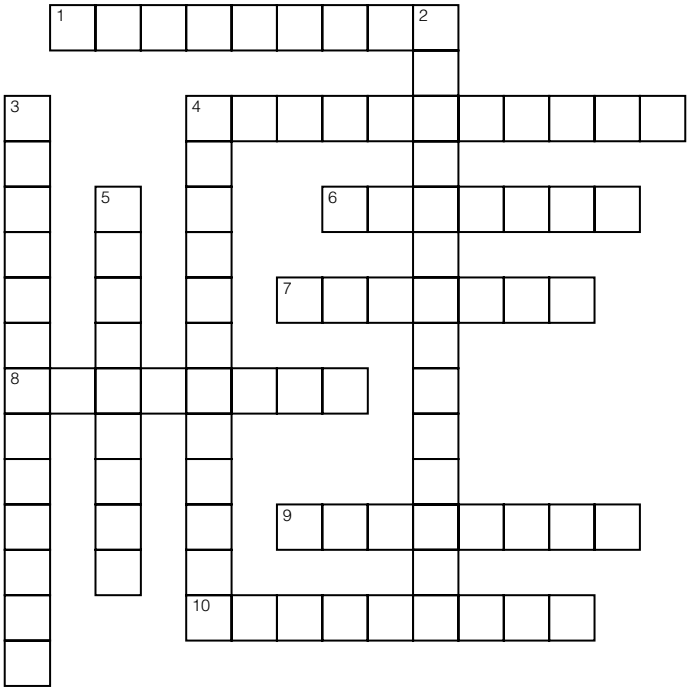
Cardiovascular	Integumentary	Nervous	Skeletal
Digestive	Lymphatic (Immune)	Reproductive	Urinary
Endocrine	Muscular	Respiratory	

Across

1. Protects the body; destroys bacteria and tumor cells.
4. Removes carbon dioxide from the blood.
6. Rids the body of nitrogen-containing wastes; conserves body water or eliminates excesses.
7. Includes the brain, nerves, and sensory receptors.
8. Moves the limbs; allows facial expression.
9. Provides support and levers on which the muscular system can act.
10. Is affected by the removal of the thyroid gland.

Down

2. Delivers oxygen and nutrients to the body tissues.
3. Protects underlying organs from drying out and from mechanical damage.
4. Includes the testis, vas deferens, and urethra.
5. Includes the esophagus, large intestine, and rectum.



6. Figures 1–1 to 1–6, on pages 4–6, represent the various body organ systems. Complete the following:
(A) Identify and name each organ system by labeling the organ system under each illustration.
(B) Select a different color for each organ and use it to color the coding circles and corresponding structures in the illustrations.

◯ Blood vessels

◯ Heart

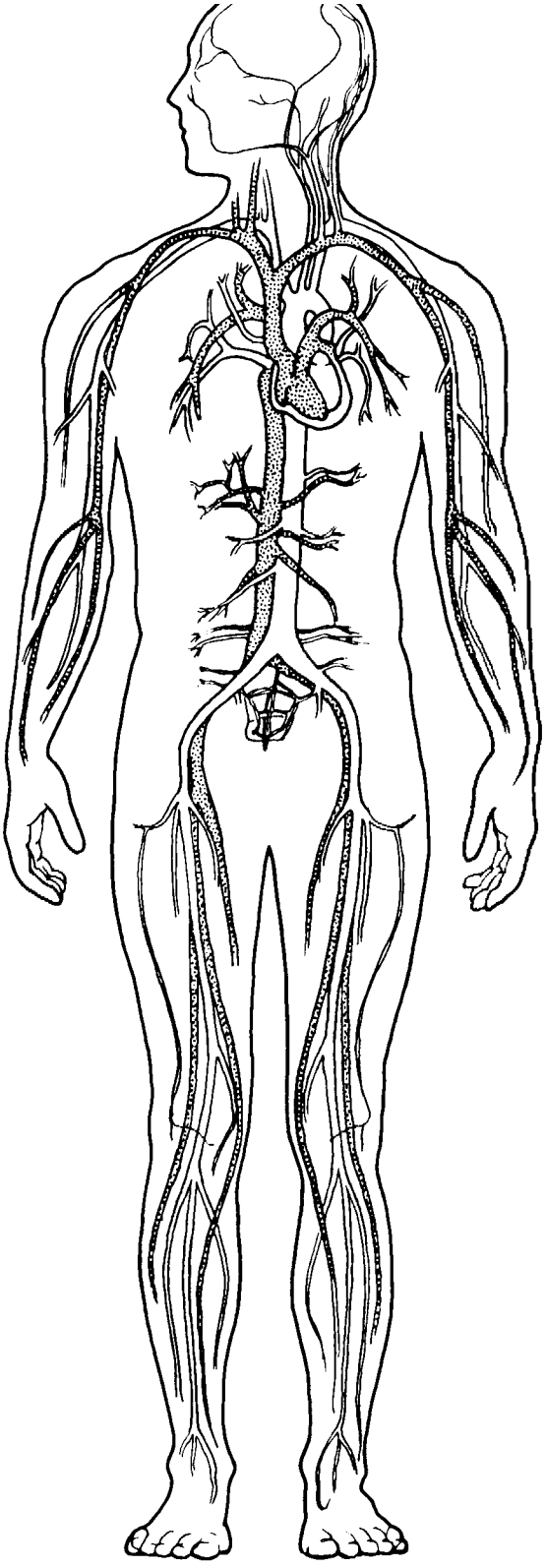


Figure 1–1

Organ System: _____

◯ Nasal cavity

◯ Lungs

◯ Trachea

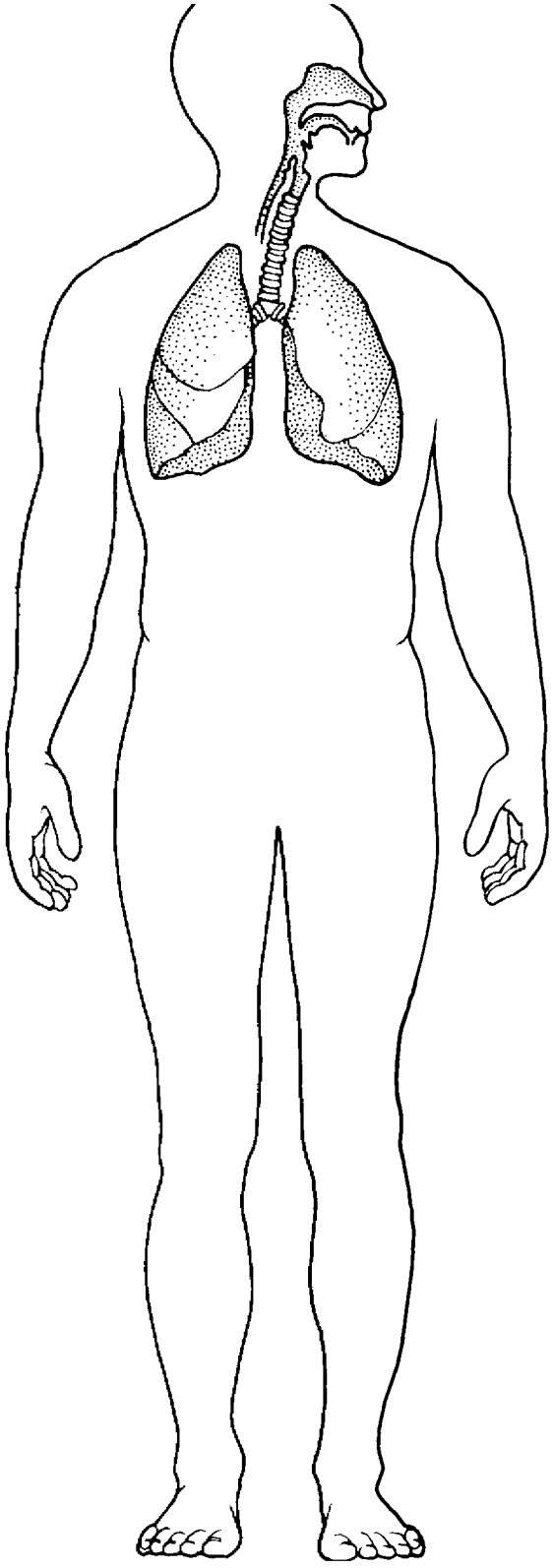


Figure 1–2

Organ System: _____

◯ Brain
◯ Spinal cord
◯ Nerves

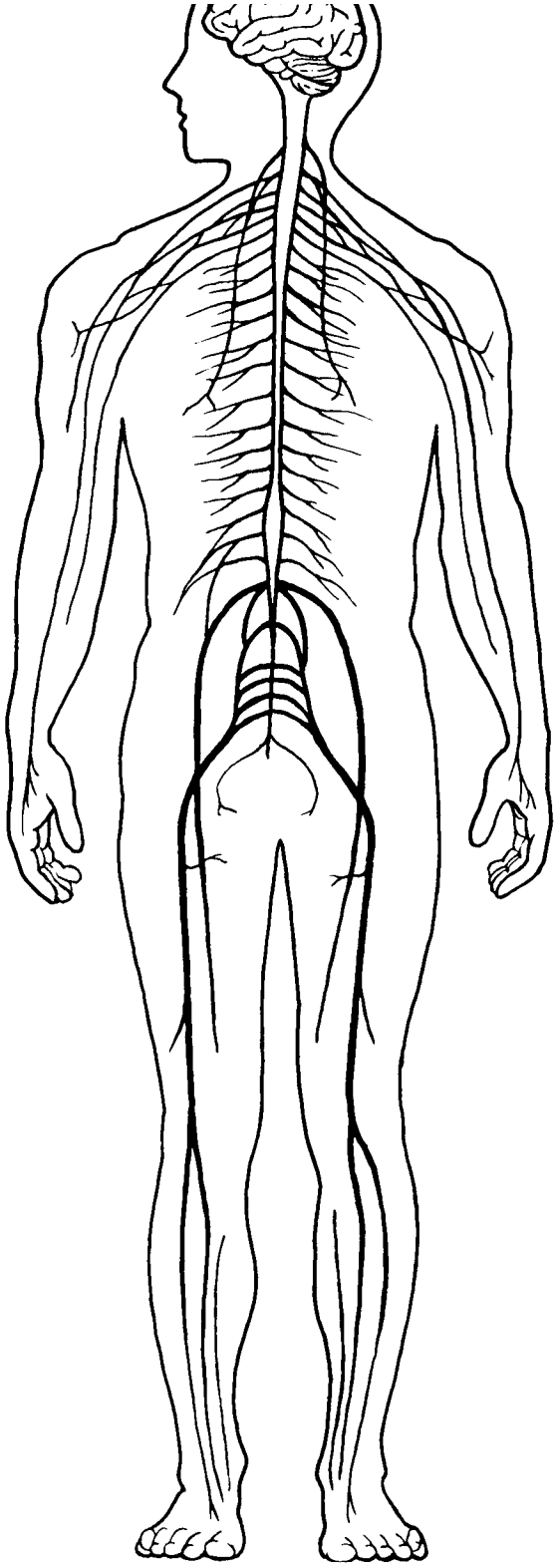


Figure 1–3

Organ System: _____

◯ Kidneys
◯ Ureters
◯ Bladder

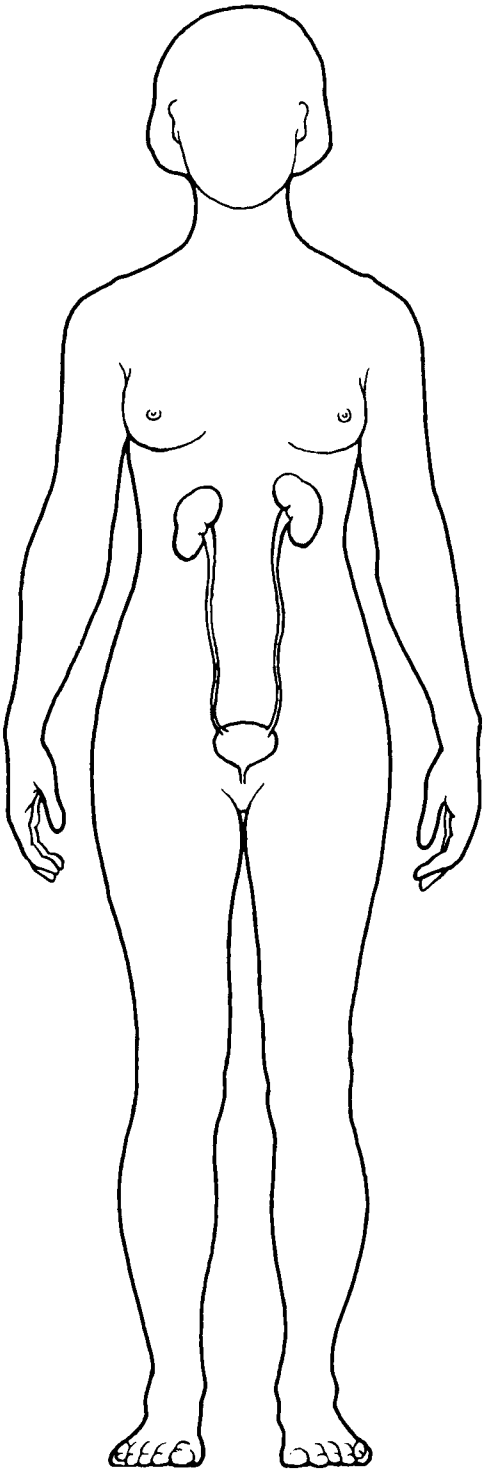


Figure 1–4

Organ System: _____

◯ Stomach ◯ Esophagus ◯ Ovaries

◯ Intestines ◯ Oral cavity ◯ Uterus

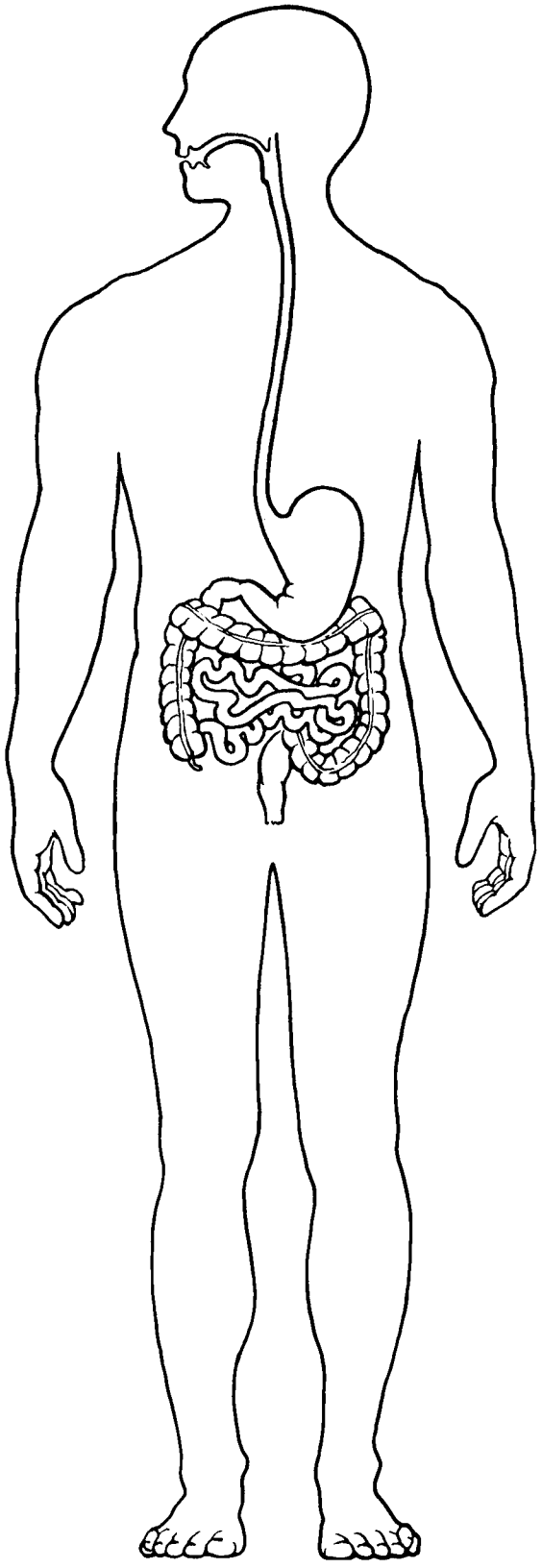


Figure 1–5

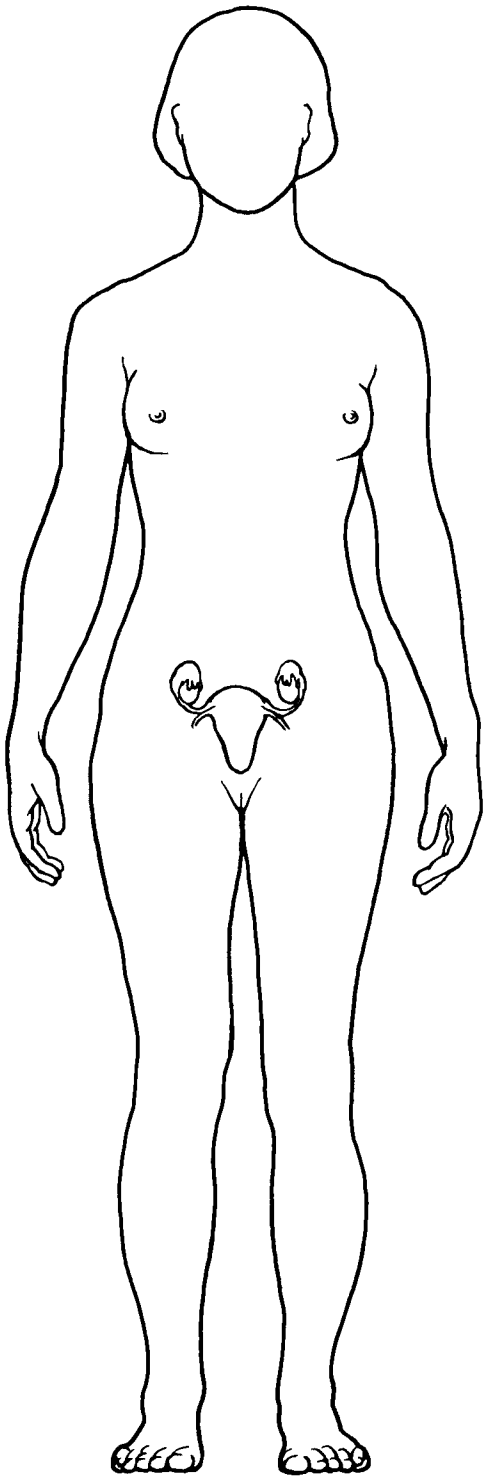


Figure 1–6

Organ System: _____

Organ System: _____

MAINTAINING LIFE

7. Match the terms that relate to functional characteristics of organisms in Column B with the appropriate descriptions in Column A. Fill in the answer blanks with the appropriate letter or term.

Column A		Column B
_____	1. Keeps the body's internal environment distinct from the external environment	A. Digestion
_____	2. Provides new cells for growth and repair at a cellular level	B. Excretion
_____	3. Occurs when constructive activities occur at a faster rate than destructive activities	C. Growth
_____	4. The tuna sandwich you have just eaten is broken down to its chemical building blocks	D. Maintenance of boundaries
_____	5. Elimination of carbon dioxide by the lungs and elimination of nitrogenous wastes by the kidneys	E. Metabolism
_____	6. Ability to react to stimuli; a major role of the nervous system	F. Movement
_____	7. Walking, throwing a ball, riding a bicycle	G. Responsiveness
_____	8. All chemical reactions occurring in the body	H. Reproduction
_____	9. At the cellular level, membranes; for the whole organism, the skin	

8. Using the key choices, correctly identify the survival needs that correspond to the following descriptions. Insert the correct letter or term in the answer blanks. Letters or terms can be used more than once.

Key Choices

A. Appropriate body temperature
B. Atmospheric pressure
C. Nutrients
D. Oxygen
E. Water

_____ 1. Includes carbohydrates, proteins, fats, and minerals

_____ 2. Essential for normal operation of the respiratory system and breathing

_____ 3. Single substance accounting for more than 60% of body weight

_____ 4. Required for the release of energy from foodstuffs

_____ 5. Provides the basis for body fluids of all types

_____ 6. When too high or too low, physiological activities cease, primarily because molecules are destroyed or become nonfunctional

HOMEOSTASIS

9. The following statements refer to homeostatic control systems. Complete each statement by inserting your answers in the answer blanks.

_____ 1.
_____ 2.
_____ 3.
_____ 4.
_____ 5.
_____ 6.
_____ 7.
_____ 8.
_____ 9.

There are three essential components of all homeostatic control mechanisms: control center, receptor, and effector. The __(1)__ senses changes in the environment and responds by sending information (input) to the __(2)__ along the __(3)__ pathway. The __(4)__ analyzes the input, determines the appropriate response, and activates the __(5)__ by sending information along the __(6)__ pathway. When the response causes the initial stimulus to decline, the homeostatic mechanism is referred to as a __(7)__ feedback mechanism. When the response enhances the initial stimulus, the mechanism is called a __(8)__ feedback mechanism. __(9)__ feedback mechanisms are much more common in the body.

THE LANGUAGE OF ANATOMY

10. Complete the following statements by filling in the answer blanks with the correct term.

_____ 1.
_____ 2.
_____ 3.

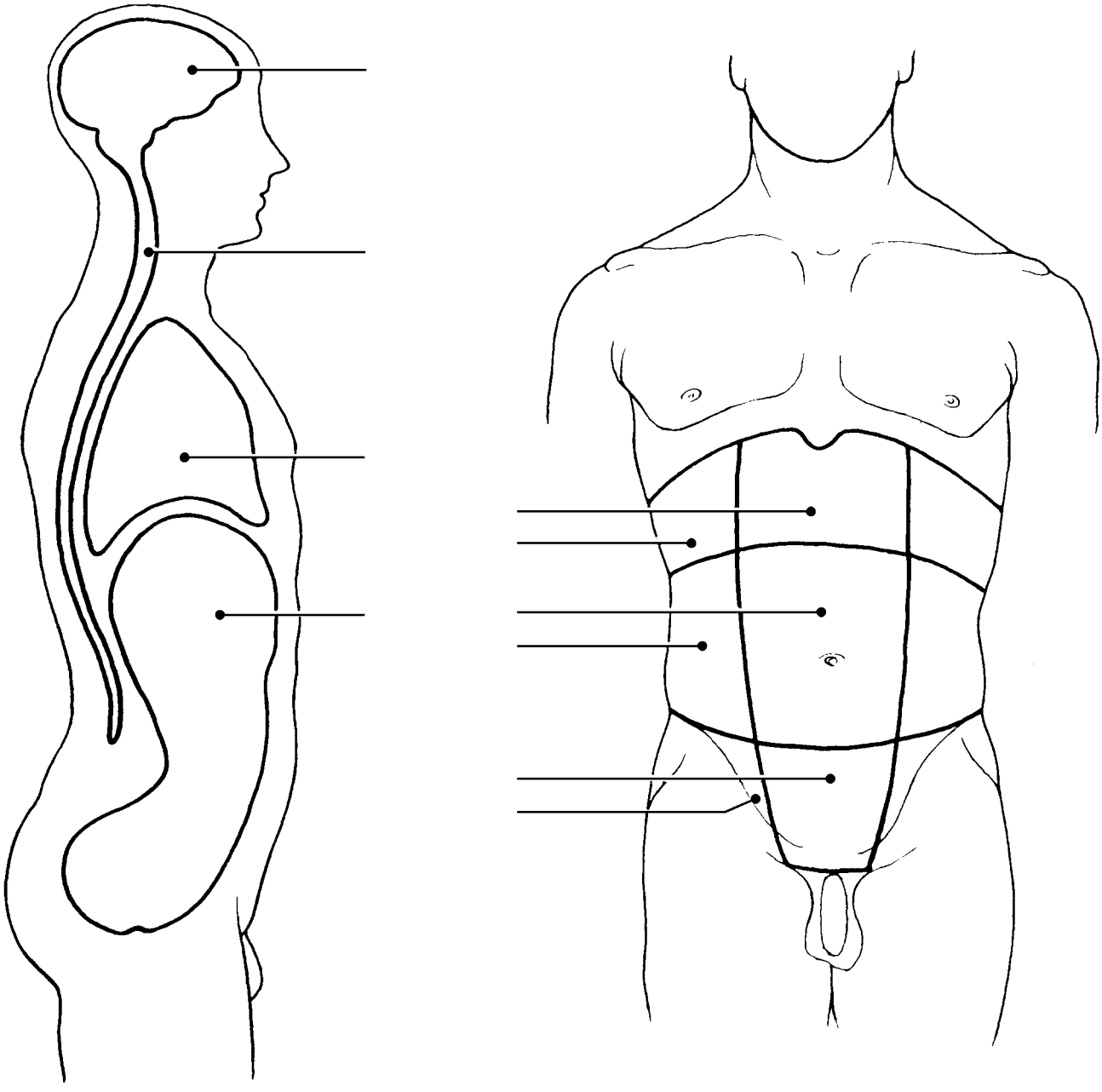
The abdominopelvic and thoracic cavities are subdivisions of the __(1)__ body cavity; the cranial and spinal cavities are parts of the __(2)__ body cavity. The __(3)__ body cavity is totally surrounded by bone and provides very good protection to the structures it contains.

11. Circle the term or phrase that does not belong in each of the following groupings. Then, fill in the answer blanks with the correct group name.

1. Transverse Distal Frontal Sagittal **Group:** _____
2. Pelvic Thoracic Antecubital Abdominal **Group:** _____
3. Sural Brachial Femoral Popliteal **Group:** _____
4. Epigastric Hypogastric Right iliac Left upper quadrant **Group:** _____
5. Orbital cavity Nasal cavity Ventral cavity Oral cavity **Group:** _____

12. Select different colors for the *dorsal* and *ventral* body cavities and color the coding circles below. Complete the following in Figure 1–7:
(A) Color the corresponding cavities in figure A.
(B) Label the body cavity subdivisions that have a leader line in figure A.
(C) Label each of the abdominal regions indicated by a leader line in figure B.

◯ Dorsal body cavity ◯ Ventral body cavity



A **B**

Figure 1–7

13. Select the key choices that identify the following body parts or areas. Enter the appropriate letter or corresponding term in the answer blanks.

Key Choices

A. Abdominal	E. Buccal	I. Inguinal	M. Pubic
B. Antecubital	F. Cervical	J. Lumbar	N. Scapular
C. Axillary	G. Femoral	K. Occipital	O. Sural
D. Brachial	H. Gluteal	L. Popliteal	P. Umbilical

_____ 1. Armpit

_____ 2. Thigh region

_____ 3. Buttock area

_____ 4. Neck region

_____ 5. "Belly button" area

_____ 6. Genital area

_____ 7. Anterior aspect of elbow

_____ 8. Posterior aspect of head

_____ 9. Area where trunk meets thigh

_____10. Back area from ribs to hips

_____11. Pertaining to the cheek

14. Using the key terms from Exercise 13, correctly label all body areas indicated with leader lines on Figure 1–8.

In addition, identify the sections labeled A and B in the figure.

Section A: _____

Section B: _____

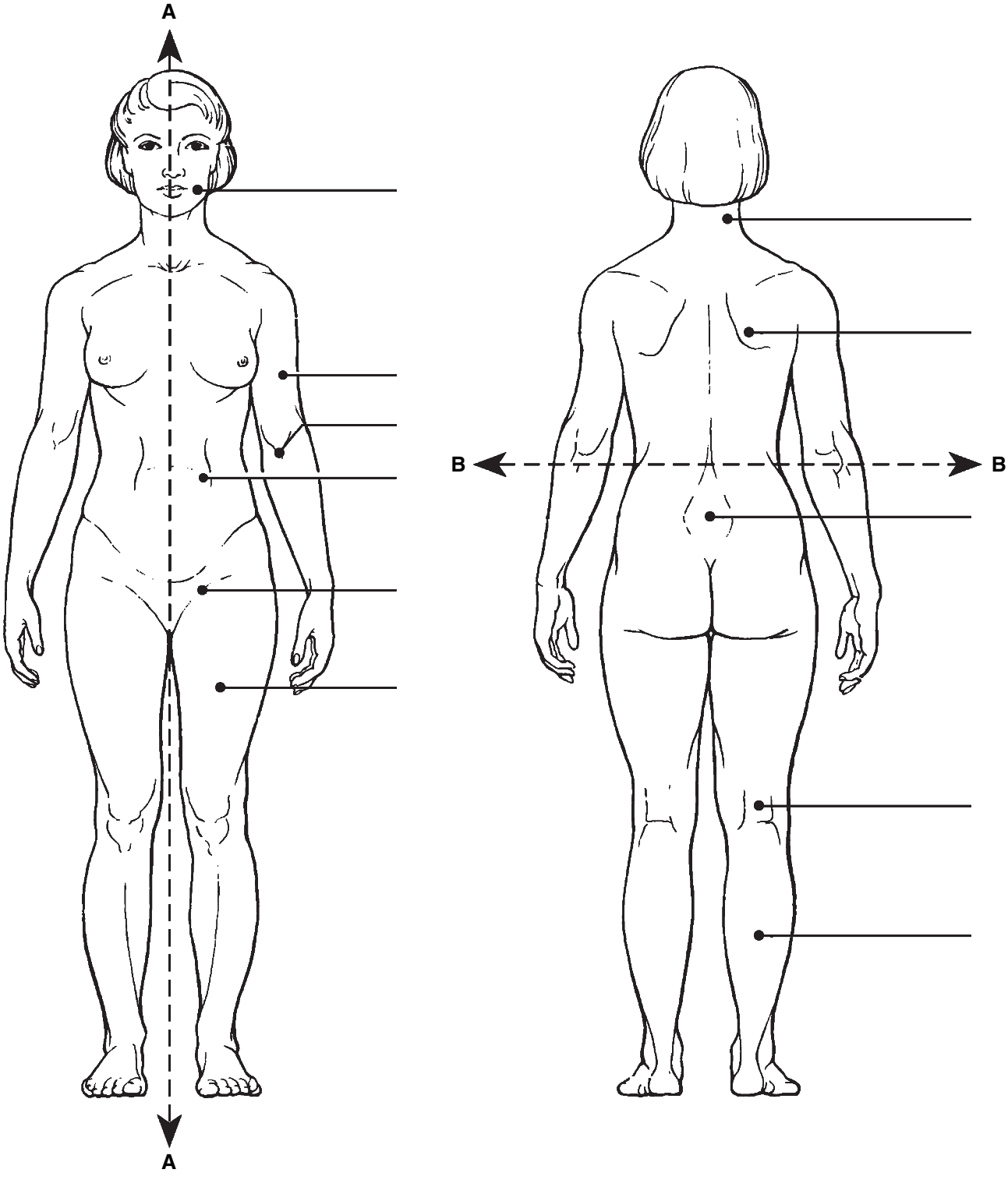


Figure 1–8

15. From the key choices, select the body cavities and the cavity subdivision where the following surgical procedures would occur. Insert the correct letter(s) or term(s) in the answer blanks. Be precise. Items may have more than one answer.

Key Choices

A. Abdominal	C. Dorsal	E. Spinal	G. Ventral
B. Cranial	D. Pelvic	F. Thoracic	

_____ 1. Removal of the uterus, or womb

_____ 2. Coronary bypass surgery (heart surgery)

_____ 3. Removal of a serious brain tumor

_____ 4. Removal of a "hot" appendix

_____ 5. A stomach ulcer operation

16. Complete the following statements by choosing an anatomical term from the key choices. Enter the appropriate letter or term in the answer blanks.

Key Choices

A. Anterior	D. Inferior	G. Posterior	J. Superior
B. Distal	E. Lateral	H. Proximal	K. Transverse
C. Frontal	F. Medial	I. Sagittal	

_____ 1.
_____ 2.
_____ 3.
_____ 4.
_____ 5.
_____ 6.
_____ 7.
_____ 8.
_____ 9.
_____10.
_____11.

In the anatomical position, the face and palms are on the __(1)__ body surface, the buttocks and shoulder blades are on the __(2)__ body surface, and the top of the head is the most __(3)__ part of the body. The ears are __(4)__ to the shoulders and __(5)__ to the nose. The heart is __(6)__ to the spine and __(7)__ to the lungs. The elbow is __(8)__ to the fingers but __(9)__ to the shoulder. In humans, the dorsal surface can also be called the __(10)__ surface; however, in four-legged animals, the dorsal surface is the __(11)__ surface.

_____12.
_____13.
_____14.
_____15.

If an incision cuts the heart into right and left parts, the section is a __(12)__ section, but if the heart is cut so that anterior and posterior parts result, the section is a __(13)__ section. You are told to cut an animal along two planes so that the paired kidneys are observable in both sections. The two sections that meet this requirement are the __(14)__ and __(15)__ sections.

17. Using the key choices, identify the body cavities where the following body organs are located. Enter the appropriate letter or term in the answer blanks. Letters or terms can be used more than once.

Key Choices

A. Abdominopelvic B. Cranial C. Spinal D. Thoracic

_____ 1. Stomach
_____ 2. Small intestine
_____ 3. Large intestine
_____ 4. Spleen
_____ 5. Liver
_____ 6. Spinal cord
_____ 7. Bladder
_____ 8. Trachea
_____ 9. Lungs
_____ 10. Pituitary gland
_____ 11. Rectum
_____ 12. Ovaries

18. Number the following structures, from darkest (black) to lightest (white), as they would appear on an X-ray. Number the darkest one 1, the next darkest 2, etc. (Hint: Denser structures appear lighter).

_____ A. Soft tissue
_____ B. Femur (bone of the thigh)
_____ C. Air in lungs
_____ D. Gold (metal) filling in a tooth

AT THE CLINIC

19. A jogger has stepped in a pothole and sprained his ankle. What organ systems have suffered damage?

20. A newborn baby is unable to hold down any milk. Examination reveals a developmental disorder in which the esophagus fails to connect to the stomach. What survival needs are most immediately threatened?

21. The Chan family was traveling in their van and had a minor accident. The children in the backseat were wearing lap belts, but they still sustained bruises around the abdomen and had some internal organ injuries. Why is this area more vulnerable to damage than others?

22. John, a patient at Jones City Hospital, is in tough shape. He has a hernia in his inguinal region, pain from an infected kidney in his lumbar region, and severe bruises and swelling in his pubic region. Explain where each of these regions is located.

23. The hormone thyroxine is released in response to a pituitary hormone called TSH. As thyroxine levels increase in the blood, they exert negative feedback on the release of TSH by the pituitary gland. What effect will this have on the release of TSH?

24. In congestive heart failure, the weakened heart is unable to pump with sufficient strength to empty its own chambers. As a result, blood backs up in the veins, blood pressure rises, and circulation is impaired. Describe what will happen as this situation worsens owing to positive feedback. Then, predict how a heart-strengthening medication will reverse the positive feedback.

25. The following advanced imaging techniques are discussed in the text: CT, DSA, PET, and MRI. Which of these techniques uses X-ray? Which uses radio waves and magnetic fields? Which uses radioisotopes? Which displays body regions in sections? (You may have more than one answer for each question.)

26. A patient reports stabbing pains in the right hypochondriac region. The medical staff suspects gallstones. What region of the body will be examined?

27. Mr. Harvey, a computer programmer, has been complaining of numbness and pain in his right hand. His nurse practitioner diagnoses his problem as carpal tunnel syndrome and prescribes use of a splint. Where will Mr. Harvey apply the splint?

28. Mrs. Gallo's physician suspects that she is showing the initial signs of multiple sclerosis, a disease characterized by the formation of hardened plaques in the insulating sheaths surrounding nerve fibers. What medical imaging technique will the physician probably order to determine if such plaques are present?

THE FINALE: MULTIPLE CHOICE

29. Select the best answer or answers from the choices given.

1. Which of the following activities would *not* represent an anatomical study?
   A. Making a section through the heart to observe its interior
   B. Drawing blood from recently fed laboratory animals at timed intervals to determine their blood sugar levels
   C. Examining the surface of a bone
   D. Viewing muscle tissue through a microscope

2. The process that increases the size of the body or its number of cells is:
   A. metabolism.
   B. responsiveness.
   C. growth.
   D. digestion.

3. Which of the following is (are) involved in maintaining homeostasis?
   A. Effector
   B. Control center
   C. Receptor
   D. Feedback
   E. Lack of change

4. When a capillary is damaged, a platelet plug is formed. The process involves platelets sticking to each other. The more platelets that stick together, the more the plug attracts additional platelets. This is an example of:
   A. negative feedback.
   B. positive feedback.

5. A coronal plane through the head:
   A. could pass through both the nose and the occiput.
   B. could pass through both ears.
   C. must pass through the mouth.
   D. could lie in a horizontal plane.

6. Which of the following statements is (are) correct?
   A. The brachium is proximal to the antebrachium.
   B. The femoral region is superior to the tarsal region.
   C. The orbital region is inferior to the buccal region.
   D. The axillary region is lateral to the sternal region.
   E. The crural region is posterior to the sural region.

7. Which of the following body regions is (are) found on the torso?
   A. Gluteal
   B. Inguinal
   C. Popliteal
   D. Acromial
   E. Olecranal

8. A neurosurgeon orders a spinal tap for a patient. Into what body cavity will the needle be inserted?
   A. Ventral
   B. Thoracic
   C. Dorsal
   D. Cranial
   E. Pelvic

9. An accident victim has a collapsed lung. Which cavity has been entered?
   A. Mediastinal
   B. Pericardial
   C. Pleural
   D. Vertebral
   E. Ventral

10. Which body system would be affected by degenerative cartilage?
    A. Muscular
    B. Nervous
    C. Cardiovascular
    D. Skeletal
    E. Lymphatic

11. The position of the heart relative to the structures around it would be described accurately as:
    A. deep to the sternum (breast bone).
    B. lateral to the lungs.
    C. superior to the diaphragm.
    D. inferior to the ribs.
    E. anterior to the vertebral column.

12. What term(s) could be used to describe the position of the nose?
    A. Intermediate to the eyes
    B. Inferior to the brain
    C. Superior to the mouth
    D. Medial to the ears
    E. Anterior to the ears

13. The radiographic technique used to provide information about blood flow is:
    A. DSR.
    B. CT.
    C. PET.
    D. ultrasonography.
    E. any X-ray technique.

14. A patient complains of pain in the lower right quadrant. Which system is most likely to be involved?
    A. Respiratory
    B. Digestive
    C. Urinary
    D. Skeletal
    E. Muscular

15. Harry was sweating profusely as he ran in the 10K race. The sweat glands producing the sweat would be considered which part of a feedback system?
    A. Stimulus
    B. Effectors
    C. Control center
    D. Receptors