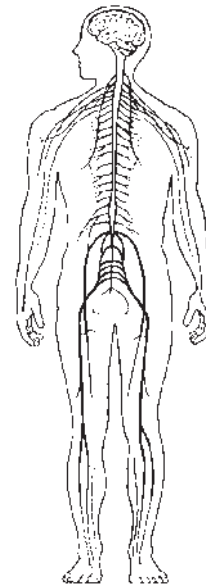


1 THE HUMAN BODY: AN ORIENTATION



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.

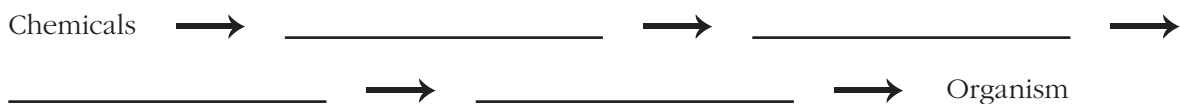
Physiology

Anatomy

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

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.



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. Neuron Erythrocyte Fibroblast Muscle Oocyte **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
Digestive
Endocrine

Integumentary
Lymphatic (Immune)
Muscular

Nervous
Reproductive
Respiratory

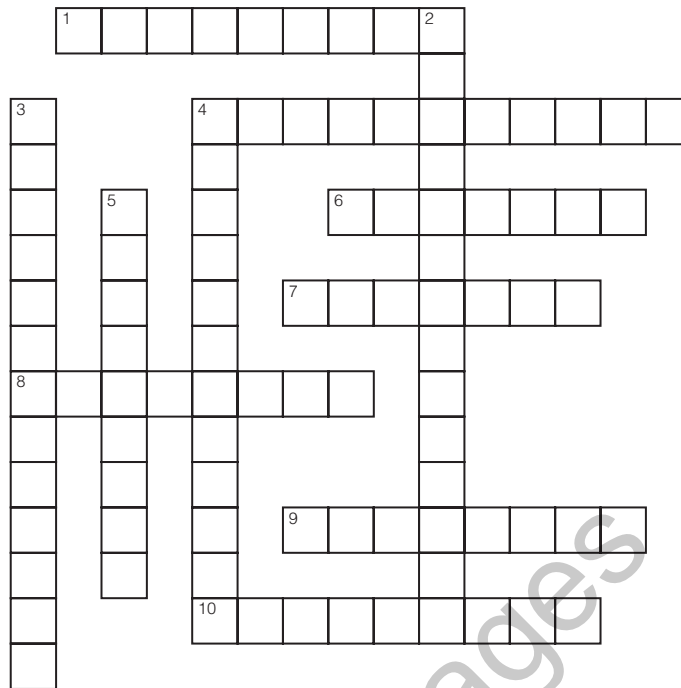
Skeletal
Urinary

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 14-16, 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

- Nasal cavity
- Lungs
- Trachea

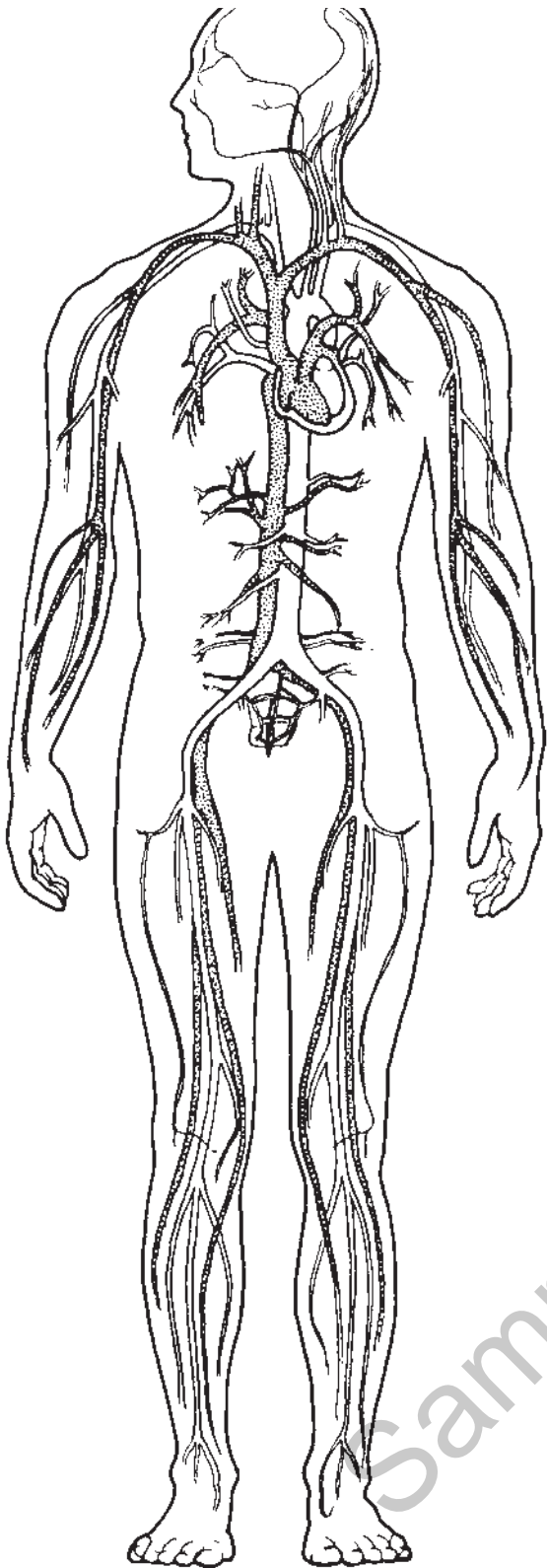


Figure 1-1

Organ System: _____

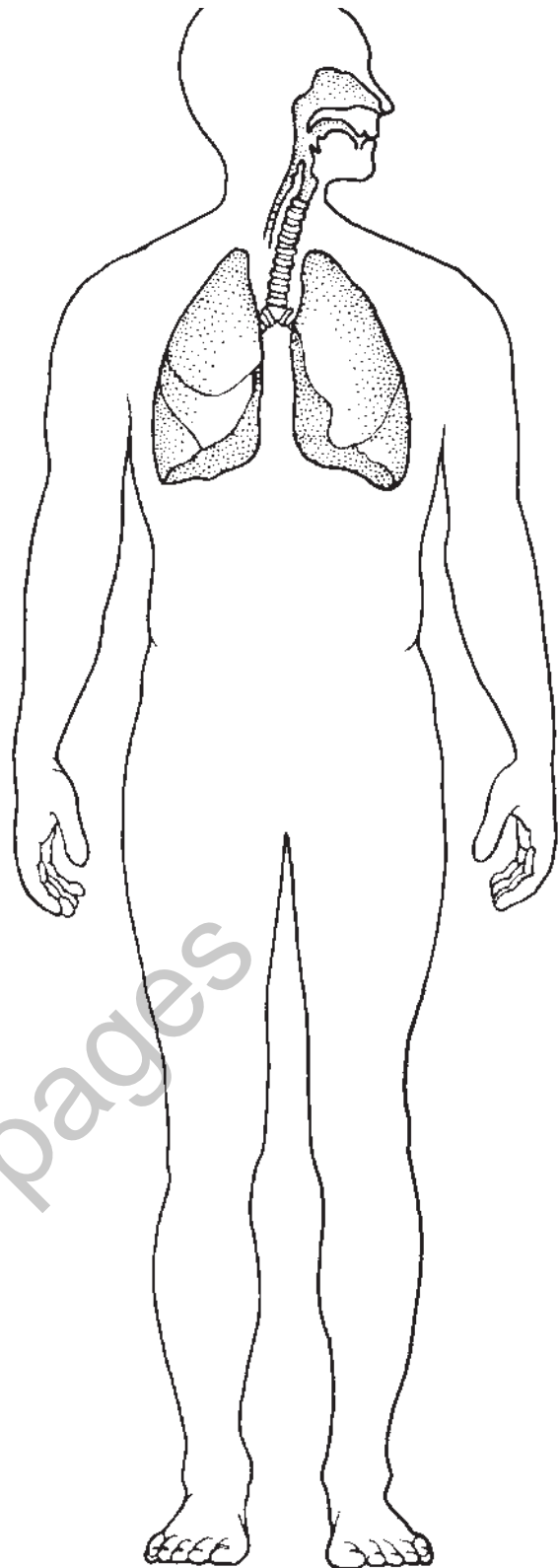


Figure 1-2

Organ System: _____

- Brain
- Spinal cord
- Nerves

- Kidneys
- Ureters
- Bladder

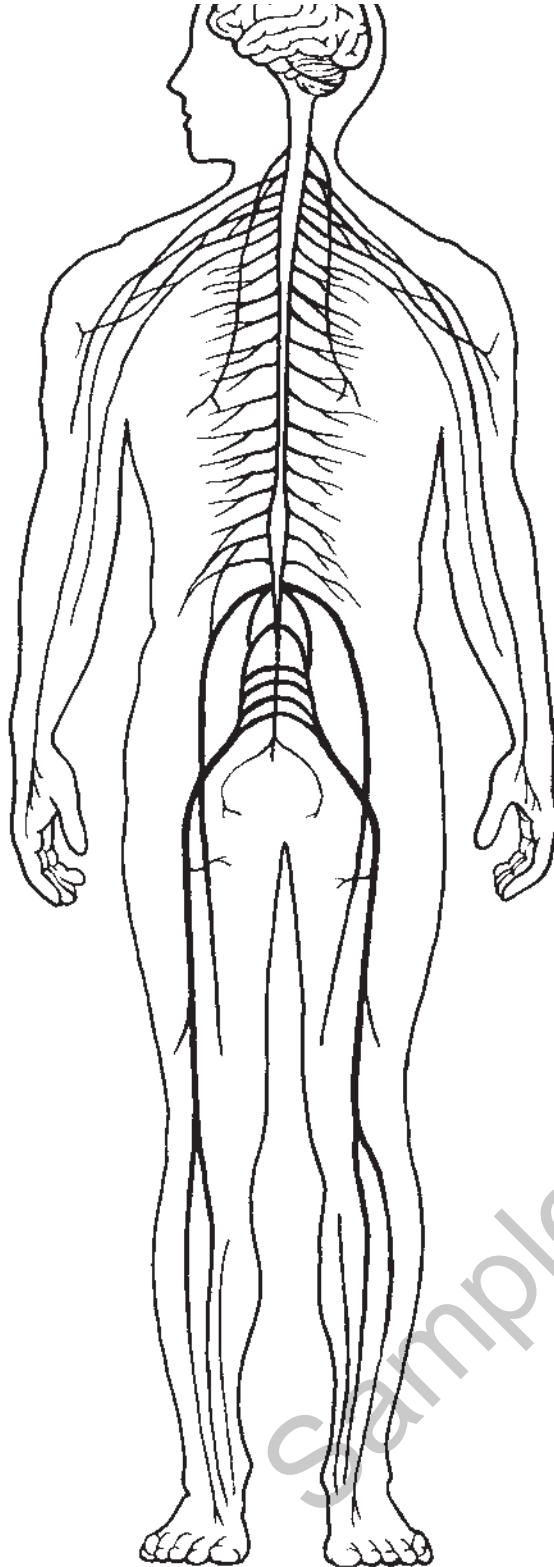


Figure 1-3

Organ System: _____

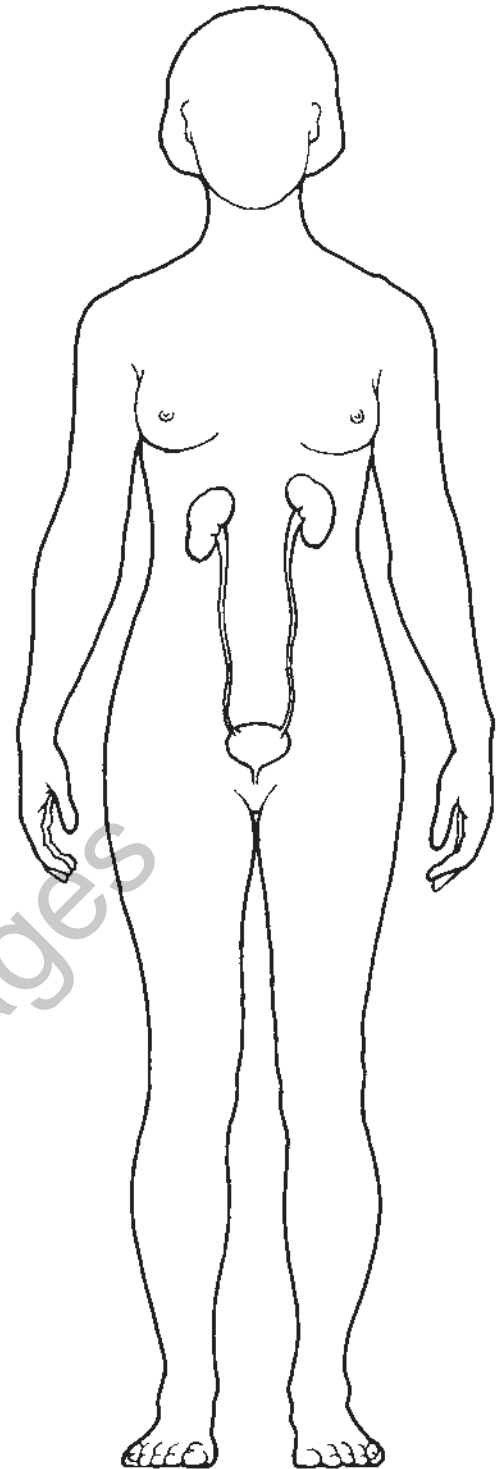


Figure 1-4

Organ System: _____

- Stomach
- Intestines

- Esophagus
- Oral cavity

- Ovaries
- Uterus

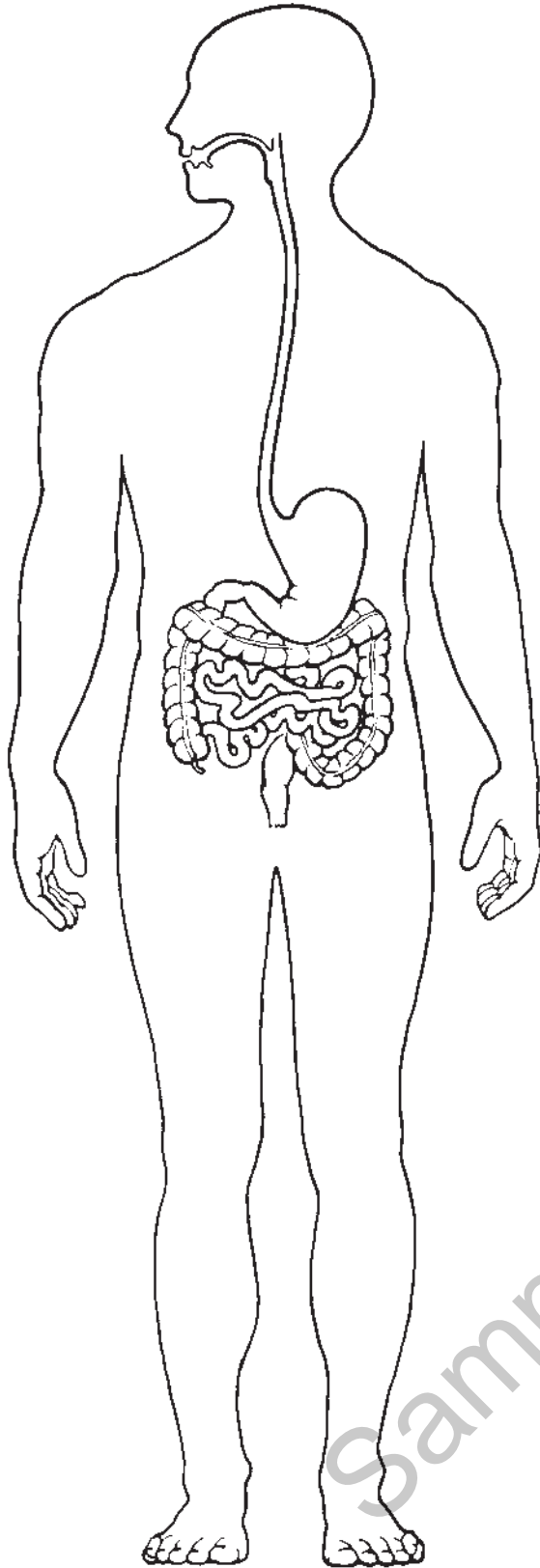


Figure 1-5

Organ System: _____

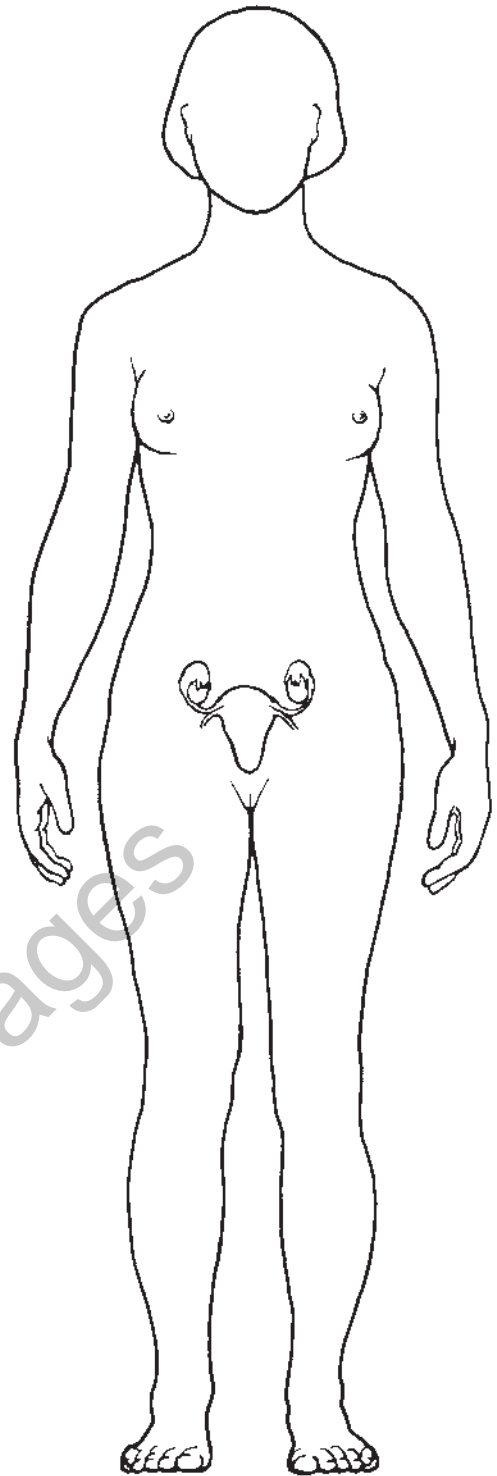


Figure 1-6

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. Production of feces to get rid of indigestible food residues | 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 | C. Nutrients | E. Water |
| B. Atmospheric pressure | D. Oxygen | |

- | |
|--|
| _____ 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. Needs to be maintained within a small range to ensure that metabolic reactions occur at appropriate rates to sustain life |

HOMEOSTASIS

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

_____ 1. There are three essential components of all homeostatic control mechanisms: control center, receptor, and effector. The _____ 2. _____ (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.

_____ 8.

_____ 9.

THE LANGUAGE OF ANATOMY

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

_____ 1. 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.

_____ 3.

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. Lateral Distal Frontal Proximal **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

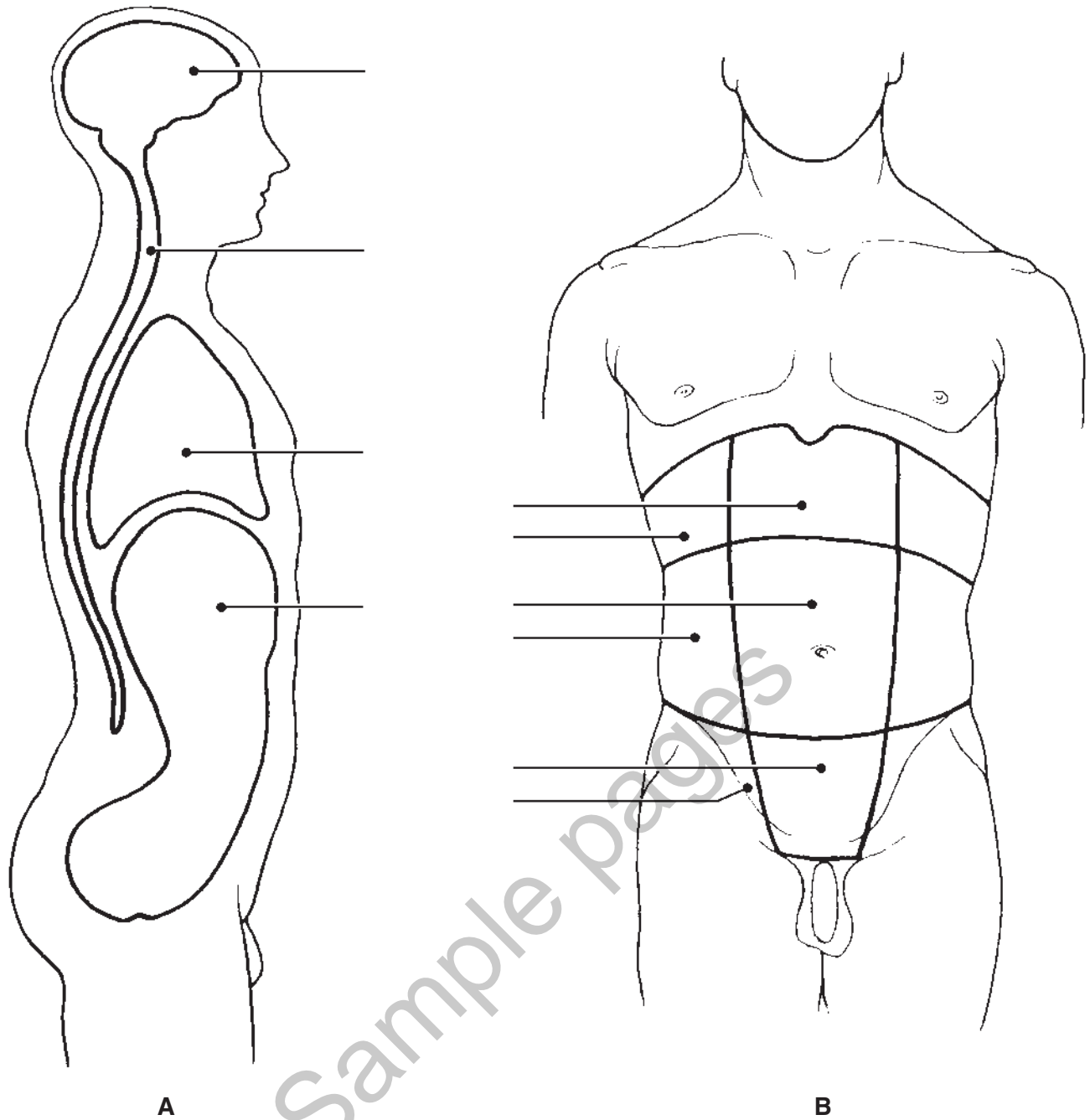


Figure 1–7

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. Shoulder blade
- _____ 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: _____

Sample pages

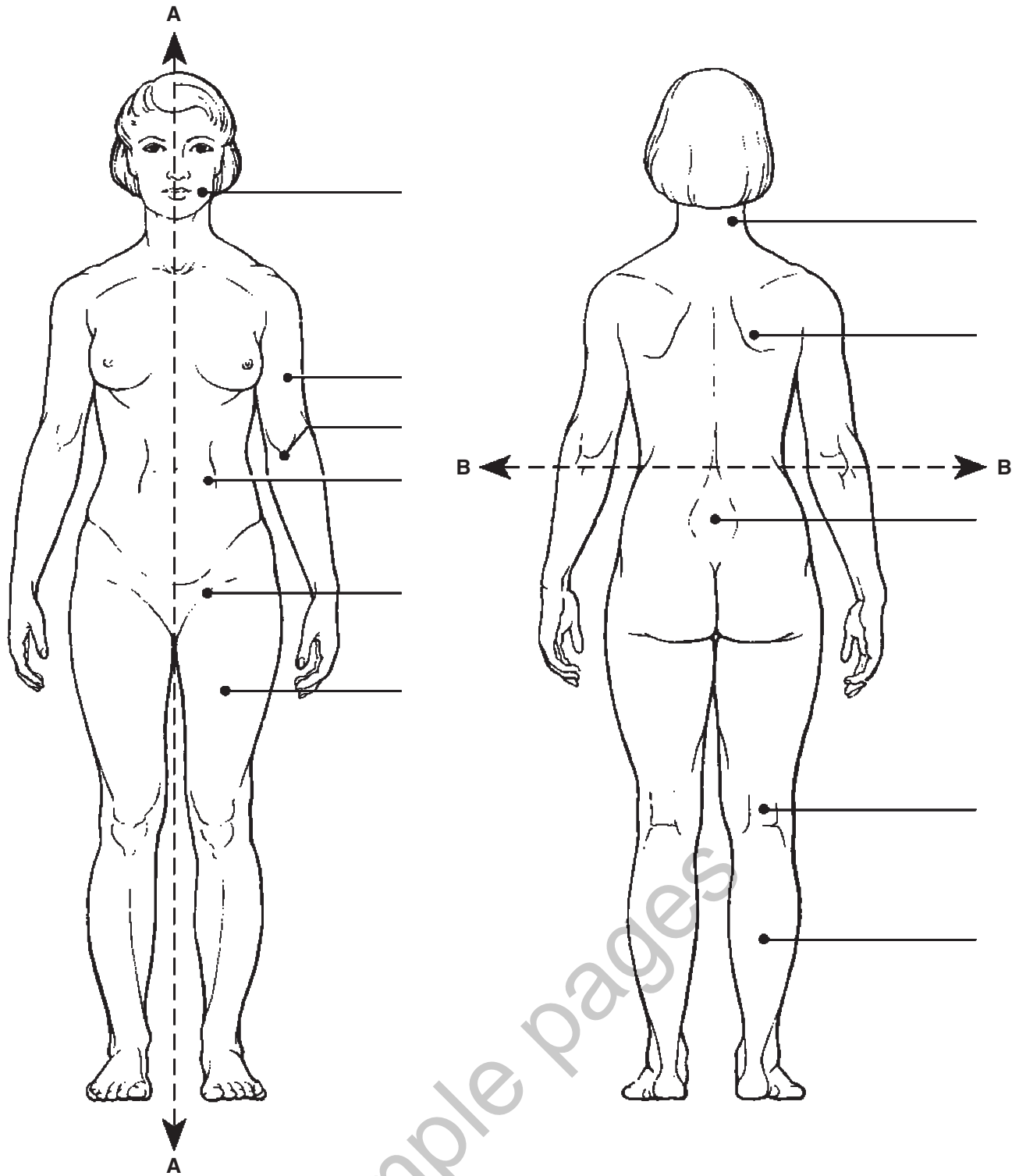


Figure 1-8

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. Insertion of a shunt for hydrocephalus (water on the brain)
- _____ 2. A gall bladder operation
- _____ 3. Removal of a lung tumor
- _____ 4. Investigation of an ovarian cyst
- _____ 5. Removal of a kidney stone

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. 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.
- _____ 2.
- _____ 3.
- _____ 4.
- _____ 5.
- _____ 6.
- _____ 7.
- _____ 8.
- _____ 9.
- _____ 10.
- _____ 11.

- _____ 12. 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.
- _____ 13. 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.
- _____ 14.
- _____ 15.

- 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 | _____ 7. Bladder |
| _____ 2. Small intestine | _____ 8. Trachea |
| _____ 3. Large intestine | _____ 9. Lungs |
| _____ 4. Spleen | _____ 10. Pituitary gland |
| _____ 5. Liver | _____ 11. Rectum |
| _____ 6. Spinal cord | _____ 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 man is carrying some heavy groceries upstairs to his second-floor apartment. Which organ systems need to respond?

- 20.** An 18-year-old student reports to the medical center complaining of a severe headache, and the appearance of a rash across his body. The staff suspects he has meningitis. Which systems are affected as a result of his symptoms?
- 21.** Some parts of the body cannot be as easily diagnosed as others. Suppose you are obliged to collect a sample of cerebrospinal fluid from the spinal cavity. What does the spinal cavity contain and why is obtaining the fluid not so easy?
- 22.** Sylvia has had her lymph nodes removed from her left armpit. She is also having a lump removed from her left breast, and will have targeted radiotherapy in this region. Identify the correct anatomical terms for the affected areas.
- 23.** While helping his dad with gardening, little Jake got a nasty cut on his forearm. He kept crying until he noticed that the bleeding stopped rather quickly. What mechanism was at work? Is this an example of a positive or a negative feedback mechanism?
- 24.** Jim is suffering from chronic kidney disease. His condition is serious and requires hemodialysis. Since Jim is severely anemic, he is administered erythropoietin (EPO). Jim asks his doctor to explain why he needs EPO, a product that Jim knows to be a forbidden drug used by sportspeople for improving athletic performance. Do you think EPO is required and through which mechanism does it operate?

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 a crushing sensation across the chest and down their left arm. Which organ is most likely to be affected?
27. Tyler has to have an injection for tetanus after falling from his skateboard. The nurse tells him that he will be injected in his gluteal region. Which clothing should Tyler remove to have his injection?
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.
- Which of the following activities would *not* represent an anatomical study?
 - Making a section through the heart to observe its interior
 - Drawing blood from recently fed laboratory animals at timed intervals to determine their blood sugar levels
 - Examining the surface of a bone
 - Viewing muscle tissue through a microscope
 - The process that results in the production of small molecules from large ones is:

| | |
|--------------|----------------|
| A. digestion | C. respiration |
| B. excretion | D. anabolism |
 - Which of the following is (are) involved in maintaining homeostasis?

| | |
|-------------------|-------------------|
| A. Effector | D. Feedback |
| B. Control center | E. Lack of change |
| C. Receptor | |

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 sagittal section through the body would pass:
 - A. through the liver, both kidneys, and pancreas
 - B. down the body's midline
 - C. through the heart and the pancreas
 - D. across the thoracic cavity
6. Which of the following statements is correct?
 - A. The knee is superior to the ankle.
 - B. The heart is superficial to the kidneys.
 - C. The sternum is posterior to the coccyx.
 - D. The ankles are rostral to the shoulders.
 - E. The eyes are inferior to the teeth.
7. Which of the following body regions is/are associated with the limbs?

| | |
|--------------|--------------|
| A. Popliteal | D. Olecranal |
| B. Acromial | E. Inguinal |
| C. Gluteal | |
8. A neurosurgeon orders a spinal tap for a patient. Into what body cavity will the needle be inserted?

| | |
|-------------|------------|
| A. Ventral | D. Cranial |
| B. Thoracic | E. Pelvic |
| C. Dorsal | |
9. An accident victim has a collapsed lung. Which cavity has been entered?

| | |
|----------------|--------------|
| A. Mediastinal | D. Vertebral |
| B. Pericardial | E. Ventral |
| C. Pleural | |
10. Which organ system is affected by the common cold?

| | |
|-----------------|-------------------|
| A. Endocrine | D. Digestive |
| B. Reproductive | E. Cardiovascular |
| C. Respiratory | |
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. | D. ultrasonography. |
| B. CT. | E. any X-ray technique. |
| C. PET. | |
14. A patient complains of pain in the upper left quadrant. Which system is most likely to be involved?

| | |
|-----------------|-------------------|
| A. Lymphatic | D. Cardiovascular |
| B. Reproductive | E. Nervous |
| C. Endocrine | |
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 | C. Control center |
| B. Effectors | D. Receptors |