# *Fundamentals of Anatomy and Physiology 5th edition Rizzo Solutions Manual*

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# Solution and Answer Guide

RIZZO, RATLIFF, FUNDAMENTALS OF ANATOMY AND PHYSIOLOGY, 5E, 2026, 9798214106915;
CHAPTER 1: THE HUMAN BODY

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## REVIEW QUESTIONS

1. Define the terms *anatomy*, *physiology*, and *pathology*.

   **Answer:**
   Anatomy is defined as the study of structure or morphology of the body and how the body parts are organized.
   Physiology is defined as the study of the function of specific body parts (at the organism level down to the molecular level), what each body part does, and how the body part completes its specific function.
   Pathology is the study of the diseases of the body.

2. List the four categories of tissues and their general function in the human body.

   **Answer:**
   Epithelial tissue, connective tissue, muscle tissue, and nervous tissue. Epithelial tissue covers and protects surfaces, both the inner surface and the outer surface. Connective tissue binds together and supports other tissues and organs. Muscle tissue generates movement by shortening or contracting with force. Nervous tissue connects the sensory and motor structures of the body.

3. Name the systems of the body and their functions. Indicate what major organs each system contains.

   **Answer:**

| System | Function | Organs |
|---|---|---|
| Integumentary system | Insulates the body, protects the body from pathogens, sunlight, and loss of fluid, and regulates body temperature and water. Contains receptor sites to detect changes in temperature and pressure. | Skin, hair, nails, sebaceous glands, and sweat glands |

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| | | |
|---|---|---|
| Skeletal system | Protects the soft and vital parts of the body and provides support for body tissues. Bones act as levers for movement. Red bone marrow produces blood cells and yellow bone marrow stores fat. Bone stores calcium and phosphorous. | Bones and cartilage |
| Muscular system | Skeletal muscles pull on bones to allow movement; smooth muscle pushes food through the digestive tract and blood through the circulatory system; and cardiac muscle causes contraction of the heart | Skeletal muscles and tendons |
| Nervous system | Controls, correlates, and regulates the other systems of the body; interprets stimuli from the outside world; and controls the special senses of sight, hearing, taste, and smell | Brain, spinal cord, and peripheral nerves |
| Endocrine system | Secretes hormones to regulate body processes | Pituitary gland, pancreas, thyroid gland, adrenal gland, parathyroid glands, ovaries and testes |
| Cardiovascular system | Pumps and distributes blood, which carries oxygen, nutrients, and wastes to and from the cells of the body | Heart and blood vessels: arteries, veins, and capillaries |
| Lymphatic system | Drains tissue spaces of excess interstitial fluids and absorb fats from the intestine and carries them to the blood. It also protects the body from disease by developing immunities and destroying most invading disease-causing microorganisms | Lymph nodes, thymus, spleen, and lymph vessels |

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| | | |
|---|---|---|
| Respiratory system | Provides the surface area for the exchange of oxygen and carbon dioxide with the blood. | Nasal cavity, pharynx, larynx, trachea, bronchi and lungs |
| Digestive System | Converts food into smaller substances for absorption and eliminates indigestible waste. | Alimentary canal (esophagus, stomach, small intestine, large intestine, rectum, anus) and accessory organs (e.g., liver and pancreas) |
| Urinary system | Chemical regulation of the blood and removes waste in the form of urine. | Kidneys, ureters, and urinary bladder |
| Reproductive system | Maintains sexual characteristics and helps perform reproductive functions. Produce and exchange gametes, house the fetus until birth, and lactation. | ovaries, uterine tubes, uterus, and vagina in the female and the testes, vas deferens, seminal vesicles, prostate gland, penis, and the urethra in the male |

4. The body has two major cavities, each divided into two lesser cavities. List them and explain what each cavity contains.

   **Answer:**
   The two main body cavities are the dorsal cavity and the ventral cavity. The dorsal cavity contains the cranial cavity and the spinal cavity. The ventral cavity contains the thoracic cavity and the abdominopelvic, or abdomen and pelvic, cavity.

5. Briefly describe cells, tissues, organs, and organ systems.

   **Answer:**
   Cells are the smallest living units. Tissue is a group of cells that perform similar functions. Organs are groups of tissue that come together to serve a common function. Organ systems are a group of organs that function closely together and make up a whole organism.

6. *Discuss how the body maintains homeostasis in terms of regulating blood glucose levels.

   **Answer:**
   Negative feedback loops are used to maintain blood glucose levels. After one eats, blood glucose increases owing to the breakdown of complex carbohydrates into simple sugar molecules (glucose). The pancreas detects the increase in blood glucose and secretes insulin. While the cells take in the glucose they require, insulin helps move the excess glucose into the liver. This causes the blood glucose levels to decrease. When the levels drop below the normal threshold, glucagon is secreted by the pancreas which breaks down glycogen to glucose. This brings back the normal glucose levels in the bloodstream.

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7. *Differentiate between positive and negative feedback and provide an example of each.

   **Answer:**
   Negative feedback is when the body revises disturbances, or reverses the variable, back to homeostatic levels. An example of negative feedback is temperature or blood glucose control. Positive feedback responds to a stimulus by increasing and amplifying the variable. An example of positive feedback is childbirth.

8. List and define the main directional terms of the body.

   **Answer:**
   The main directional terms of the body are: Posterior (toward the back) and anterior (toward the front); Superior (uppermost or above) and inferior (lowermost or below); medial (toward the middle) and lateral (toward the side); proximal (near the attachment or origin) and distal (away from the point of origin).

9. List and define the three planes of division of the body.

   **Answer:**
   The three planes of the body are sagittal, frontal (coronal), and transverse (horizontal). The sagittal plane separates the body into left and right portions. The transverse plane separates the body into superior and inferior portions. The frontal, or coronal, plane separates the body into anterior and posterior portions.

10. Describe how the body is situated in the correct anatomical position.

    **Answer:**
    In standard anatomical position, the body is standing, facing forward with arms at the sides and the palms of the hand and feet pointing forward.

***Critical Thinking Questions***

## MATCHING

Place the most appropriate number in the blank provided.

| | |
|---|---|
| _____ Superior | 1. Toward the back, dorsal |
| _____ Anterior | 2. Uppermost or above |
| _____ Inferior | 3. Toward the side |
| _____ Posterior | 4. Near the point of attachment or origin |
| _____ Medial | 5. Any plane dividing the body into superior and inferior |
| _____ Lateral | 6. Away from the point of attachment |
| _____ Proximal | 7. Toward the front, ventral |
| _____ Distal | 8. The plane vertically dividing the body into equal right and left halves |
| _____ Transverse | 9. Toward the midline of the body |
| _____ Midsagittal | 10. Lowermost or below |

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**Answer:**

1. Posterior
2. Superior
3. Lateral
4. Proximal
5. Transverse
6. Distal
7. Anterior
8. Midsagittal
9. Medial
10. Inferior

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# Instructor Manual

Rizzo and Ratliff, Fundamentals of Anatomy and Physiology, 5e, 2026, 9798214106915; Chapter 1: The Human Body

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## Purpose and Perspective of the Chapter

The purpose of this chapter is to introduce the topics of anatomy and physiology. The chapter begins by defining the terms anatomy, physiology, and pathology. Anatomical position and the universal language of anatomy, including directional terms, planes, and body cavities, are explained. The structural organization of the human body, from the cell to the organism, is outlined with specific examples of each. The chapter also includes an overview of the major organs and functions of the eleven organ systems found in the human body. Homeostasis is defined, and examples of both negative and positive feedback are provided. This chapter provides the basic concepts and terminology needed to study and understand both the structure and function of the human body.

## Chapter Objectives

The following objectives are addressed in this chapter:

1. Define the terms anatomy, physiology, and pathology.
2. Describe anatomical position.
3. Describe locations of body structures using directional terms.
4. Define the geometric planes used to divide the human body.
5. Describe the major cavities of the body and the organs they contain.
6. Describe the structural levels of organization of the body.
7. Name the four categories of tissues in the body.
8. List the major systems of the body, the organs they contain, and the functions of those systems.
9. Define homeostasis.
10. Differentiate between negative feedback and positive feedback.

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## What's New in This Chapter

Please refer to the Transition Guide for improvements in this chapter from the previous edition.

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## CHAPTER OUTLINE

I. Introduction (LO1, PPT Slide 4)
   i. Anatomy is the study of the structure or morphology of the body.
   ii. Physiology is the study of the functions of body parts, what they do, and how they do it.
   iii. Pathology is the study of diseases of the body.

II. Anatomical Position (LO2, PPT Slide 5)
   i. There is a universal standardized way of studying the human body. The four basic reference systems used are directions, planes, cavities, and structural units.
   ii. Reference systems are used assuming the body is in anatomical position.
      - Body is erect, facing forward with arms at the sides, palms of the hand and feet pointing forward.

III. Terms of Directions (LO3, PPT Slide 6)
   i. Superior/inferior- above/below
   ii. Anterior/posterior- toward the front/toward the back
      - Equivalent to ventral/dorsal in humans
   iii. Medial/lateral- toward the middle/toward the side
   iv. Proximal/distal- closer to point of attachment/ further away from point of attachment

IV. Planes (LO4, PPT Slide 7)
   i. Planes describe body/body parts when dissected.
   ii. A Sagittal plane divides the body into left and right portions.
      - A midsagittal plane divides the body into left and right portions at the midline.
   iii. A transverse plane divides the body into superior and inferior portions.
   iv. A frontal (coronal) plane divides the body into anterior and posterior portions.

V. Cavities (LO5, PPT Slides 8-11)
   i. The two major cavities are the dorsal and ventral cavities.
   ii. Within each cavity are the viscera, or internal organs.
   iii. The dorsal cavity is subdivided into the cranial cavity, which contains the brain, and the spinal cavity, which contains the spinal cord.
   iv. The ventral cavity is subdivided into the thoracic cavity and the abdominopelvic cavity.
   v. The thoracic cavity is surrounded by the ribcage.
   vi. It contains the heart, which is surrounded by the pericardial cavity, and the lungs, which are surrounded by the pleural cavities.

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vii. The mediastinum is the space surrounded by the two pleural cavities
- It contains the heart, thymus, trachea, esophagus, lymph and blood vessels, and nerves.

viii. The abdominopelvic cavity is separated from the thoracic cavity by the diaphragm.
- It includes the kidneys, stomach, liver and gallbladder, small and large intestines, spleen, pancreas, and the ovaries and uterus in females.

ix. The term parietal refers to the lining of body cavities, and the term visceral refers to the covering of an organ.

VI. Structural Units (LO 6-8, PPT Slides 12-28)

i. All living organisms are made up of one or more cells. The cell is the smallest unit of life.
- Cells perform all basic functions of life, including metabolism, assimilation, digestion, excretion, and reproduction.

ii. Cells are organized into tissues.
- The four major tissue types in the human body are epithelial, connective, muscle, and nervous.
  a) Epithelial tissue covers and protects.
  b) Connective tissue binds and supports other tissues and organs.
  c) Muscle tissue is designed for producing movement.
  d) Nervous tissue connects sensory and motor pathways in the body.

iii. Tissues are arranged as organs that serve a common function.
- The stomach, heart, liver, skin, and lungs are examples of organs.

iv. A group of organs that work together are called an organ system.

v. There are eleven organ systems in the human body.

vi. The integumentary system is made up of skin, hair, nails, sebaceous glands, and sweat glands.
- It protects and insulates the body and maintains water balance and temperature regulation.

vii. The skeletal system is composed of bones, cartilage, and the membranous structures associated with them.
- Its functions include blood cell formation, storage of fat and minerals, movement, and protection.

viii. The muscular system includes muscles, fibrous connective tissue, tendon sheaths, and bursae.
- The muscular system produces movement of the body, pushes food and blood through the body, and produces heart contractions.
- It also helps maintain body temperature homeostasis.

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ix. The nervous system consists of the brain, spinal cord, cranial nerves, peripheral nerves, and sensory and motor structures of the body.
    - Its functions include controlling, correlating, and regulating other body systems, interpreting stimuli from the outside world, and controlling the special senses of sight, hearing, taste, and smell.

x. The endocrine system is composed of ductless glands, including the pituitary, thyroid, adrenals, ovaries, and testes.
    - Endocrine glands produce hormones that chemically regulate the body's functions.
    - The endocrine system works with the nervous system through the hypothalamus of the brain, which controls the pituitary gland.

xi. The cardiovascular system consists of the heart, arteries, veins, and capillaries.
    - It pumps and distributes blood (which carries oxygen, nutrients, and wastes) throughout the body.

xii. The lymphatic, or immune, system is made up of the lymph nodes, the thymus gland, the spleen, and the lymph vessels.
    - It drains tissue spaces of excess fluids, absorbs fats from the intestine, and carries them to the blood.
    - It also protects the body from disease by destroying most invading disease-causing microorganisms.

xiii. The respiratory system is composed of the nasal cavities, pharynx, larynx, trachea, bronchi, and lungs.
    - It brings oxygen to and eliminates carbon dioxide from the blood.

xiv. The digestive system includes the alimentary canal (mouth, esophagus, stomach, small and large intestines, rectum, and anus) and associated glands (salivary, liver, and pancreas).
    - The digestive system breaks down food into simpler substances that can be taken up by cells.
    - It also eliminates indigestible waste.

xv. The urinary system is made up of two kidneys, two ureters, the bladder, and the urethra.
    - Its functions include chemical regulation of the blood, the formation and elimination of urine, and the maintenance of blood pressure and pH homeostasis.

xvi. The female reproductive system includes the ovaries, uterine tubes, uterus, and vagina, and the male reproductive system includes the testes, vas deferens, seminal vesicles, prostate gland, penis, and urethra.
    - The reproductive system is responsible for the maintenance of sexual characteristics and the perpetuation of our species.

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VII. Homeostasis (LO9, PPT Slides 29-31)
- i. Homeostasis is defined as the maintenance of the internal environment of the body within certain narrow ranges.
- ii. Many organ systems help to maintain homeostasis.
- iii. Two examples of homeostasis are blood sugar levels and body temperature.
- iv. Blood glucose levels are kept within a narrow range due to two hormones released by the pancreas.
  - Blood glucose levels rise after a carbohydrate-rich meal, as carbohydrates are broken down into simple sugars.
  - High blood glucose levels trigger the pancreas to release insulin.
  - The insulin release results in the liver taking up excess glucose from the blood and storing it in the liver as glycogen.
  - When blood sugar levels are low (between meals) the pancreas releases glucagon.
  - Glucagon triggers the release of simple sugars from the stored glycogen.
- v. Changes in body temperature away from the normal set point (around 98.6° F) are detected by the hypothalamus of the brain.
  - When body temperature becomes too warm, sweat glands are activated, and evaporation of sweat cools the body.
    - a) Dilation of blood vessels brings warm blood closer to the surface of the body to dissipate heat.
- vi. When body temperature becomes too low, muscles contract and produce shivering to warm the body.
  - Constriction of blood vessels conserves heat within the body.

a. Negative and Positive Feedback (LO10, PPT Slides 32-35)
- i. Negative Feedback produces responses that adjust disturbances to our body's condition.
- ii. Negative Feedback loops have three components:
  - A sensor that monitors the environment to detect any deviation from homeostasis.
  - A control center that receives information from the sensor and signals effectors to cause a change that corrects the deviation.
  - Effectors (muscles and glands) that cause a response in the body that corrects the deviation.
- iii. Negative feedback decreases or shuts down the original stimulus when homeostasis is disrupted.

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iv. Positive feedback responds to a stimulus by increasing and amplifying the change.
    - During labor, contractions trigger the release of oxytocin from the pituitary gland, which causes the uterus to contract with more strength and frequency.
    - Stronger contractions put more pressure on the cervix, which triggers the release of more oxytocin.
    - Contractions continue to intensify until the child is born.
    - Positive feedback loops continue until the stimulus is removed and are not used to maintain homeostasis.

v. Loss of homeostasis results in disease conditions and possibly death.

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