# ANSWERS TO PRACTICE QUESTIONS

# Chapter 1

## Practice 1.1

1. **What factors probably stimulated an early interest in the human body?**

Factors include attempting to understand the causes of various injuries, illnesses, and the loss of function of body parts, and trying to treat these conditions.

1. **What kinds of activities helped promote the development of modern medical science?**

Activities include dissection of cadavers, the production of prosthetic body parts, experimentation to improve medical knowledge and techniques, and the discovery of certain chemicals in nature as treatments for specific conditions.

## Practice 1.2

1. **Why is it difficult to separate the topics of anatomy and physiology?**

Structure is closely related to function; body parts are shaped and arranged (anatomy) in such a way that they are able to perform their functions (physiology).

1. **List examples that illustrate how the structure of a body part makes possible its function.**

The front teeth (incisors) are pointed for grasping and tearing food, while the back teeth (molars) are flattened for grinding food. The jointed structure of the bones of the fingers allow us to grasp objects. The cone-shaped, chambered heart pumps blood through the blood vessels. The tubular blood vessels transport blood to the cells of the body.

## Practice 1.3

1. **How does the human body illustrate levels of organization?**

Larger structures are composed of smaller and smaller components. For example, the body consists of several systems, such as the cardiovascular system. The cardiovascular system consists of organs, such as the heart and blood vessels. The heart is composed of tissues, which consist of layers of cells. Cells are composed of organelles, which consist of molecules, and finally, atoms.

1. **What is an organism?**

An organism is a complete unit of life. Organisms range in size from a single cell to a complex living thing, like a human, which is composed of trillions of cells. Humans, as complex organisms, are composed of organ systems, organs, tissues, cells, molecules, and atoms

1. **How do body parts at different levels of organization vary in complexity?**

Typically, the higher the level of organization a structure is part of, the more complex it is. For example, a molecule is composed of two or more atoms; therefore, a molecule is more complex than an atom. An organ system, such as the cardiovascular system, is composed of organs, such as the heart and blood vessels. Therefore, an organ system is more complex than any of its organs.

## Practice 1.4

1. **What are the characteristics of life?**

The characteristics of life are properties that all living organisms exhibit. They include movement, reproduction, responsiveness, growth, and metabolism, which in turn consists of the processes of respiration, digestion, circulation, and excretion.

1. **How are the characteristics of life dependent on metabolism?**

Metabolism is the sum of all the chemical reactions that occur in the cells. Metabolism supports life processes. For example, digestion of food is accomplished by metabolic reactions that break down the food into smaller particles that can be absorbed across the membrane of the small intestine. Once absorbed, food particles are circulated, and used for growth, movement, and reproduction. Wastes from food are excreted.

## Practice 1.5

1. **Which requirements of organisms does the external environment provide?**

The environment provides water, food, oxygen, heat, and pressure.

1. **Why is homeostasis important to survival?**

Homeostasis is the maintenance of a stable internal environment, which consists of the fluid around our body cells. Changes in the external environment affect the internal environment, and therefore, the health of our cells. Cells, tissues, organs, and systems function properly only in the presence of certain concentrations of water, oxygen, hydrogen ions (pH), and nutrients, and specific conditions of heat and pressure. Having enough water in our cells prevents dehydration, shrinkage of cell nuclei, and cell death. Homeostatic pH prevents irreversible alteration of enzyme structure (denaturation) and function.

1. **Describe two homeostatic mechanisms.**

Negative feedback is a common homeostatic mechanism. When a variable deviates from its set point, this mechanism activates effectors that return the variable toward its normal range. For example, if a person is too hot, sweating and increased blood flow to the skin return the body temperature to its normal range. A less common mechanism is positive feedback, in which a change in a variable leads to further change. During blood clotting, certain chemicals stimulate further blood clotting, to stop the bleeding.

## Practice 1.6

1. **Which organ occupies the cranial cavity? The vertebral canal?**

The brain occupies the cranial cavity, and the spinal cord occupies the vertebral canal.

1. **What does *viscera* mean?**

“Viscera” refers to the organs within the thoracic and abdominopelvic cavities.

1. **Name the cavities of the head.**

The small cavities of the head include the oral cavity, nasal cavity, orbital cavities, and middle ear cavities. The cranial cavity is the large cavity of the head; it is occupied by the brain.

1. **Describe the membranes associated with the thoracic and abdominopelvic cavities.**

Double-layered serous membranes line the walls of the thoracic and abdominopelvic cavities and surround each organ. The parietal layer lines the wall of the cavity, and the visceral layer surrounds an organ. Between the layers is a potential space, or cavity, filled with lubricating fluid. The pleural membranes surround the lungs, the pericardial membrane surrounds the heart, and the peritoneal membrane surrounds the abdominopelvic organs.

1. **Name and list the organs of the major organ systems.**

Integumentary system: skin, hair, nails, sweat and sebaceous glands

Skeletal system: bones

Muscular system: muscles

Nervous system: brain, spinal cord, nerves, and sense organs

Endocrine system: endocrine glands

Cardiovascular system: heart, arteries, veins, capillaries, and blood

Lymphatic system: lymph nodes, thymus, and spleen

Digestive system: mouth, teeth, tongue, pharynx, esophagus, stomach, small intestine, large intestine, salivary glands, liver, pancreas, and gallbladder

Respiratory system: nasal cavity, pharynx, larynx, trachea, bronchi, and lungs

Urinary system: kidneys, ureters, urinary bladder, and urethra

Reproductive system of male: scrotum, testes, epididymides, ductus deferentia, seminal vesicles, prostate gland, bulbourethral glands, penis, and urethra

Reproductive system of female: ovaries, uterine tubes, uterus, vagina, clitoris, and vulva

1. **Describe the general functions of each organ system.**

Integumentary system: Protects internal structures, regulates body temperature, detects changes in environment via sensory receptors, and synthesizes specific chemicals, such as vitamin D

Skeletal system: Provides a framework for the body, supports and protects internal organs and soft tissues, helps with body movements, produces blood cells, and stores inorganic salts, such as calcium salts

Muscular system: Provides force to move body parts, maintains posture, and produces most of the body heat

Nervous system: Regulates and adjusts organ function for homeostasis; communicates via nerve impulses to help detect changes in the environment, integrate information, and respond to this information by stimulating muscles and glands

Endocrine system: Regulates and adjusts organ function for homeostasis, and communicates via hormone secretion into body fluids; each hormone alters metabolism of specific target cells

Cardiovascular system: Transports red and white blood cells, platelets, respiratory gases, nutrients, hormones, and wastes throughout the body

Lymphatic system: Defends the body against infection and disease, transports some tissue fluid back to the bloodstream, and carries large fats from the digestive system to the general circulation

Digestive system: Receives nutrients from the environment, breaks down food particles into smaller molecules that can be absorbed across cell membranes and enter body fluids, eliminates wastes, and produces hormones to regulate digestive processes

Respiratory system: Moves air into and out of the lungs, and exchanges oxygen and carbon dioxide between the lungs and the blood

Urinary system: Removes blood wastes, helps maintain water, electrolyte, and acid-base balance, produces urine, and transports urine to the outside of the body

Reproductive system of male: Produces and maintains sperm, produces hormones that develop male body type, and transfers sperm to the female reproductive tract

Reproductive system of female: Produces and maintains oocytes (eggs), produces hormones that develop female body type, receives sperm for fertilization, supports development of the embryo and fetus, functions in birth process, and nourishes infant

## Practice 1.7

1. **Describe the anatomical position.**

A person in the anatomical position is standing up straight, facing forward, has upper limbs at the sides, and the palms are facing forward.

1. **Using the appropriate terms, describe the relative positions of several body parts.**

The head is superior to the neck.

The foot is inferior to the knee.

The toes are anterior to the heel.

The brain is posterior to the nose.

The great toe is medial to the smallest toe.

The thumb is lateral to the smallest finger.

The kidneys are bilateral.

The left kidney and the spleen are ipsilateral.

The left kidney and the right kidney are contralateral.

The knee is proximal to the foot.

The knee is distal to the thigh.

The skin is superficial to the subcutaneous layer.

The lens of the eye is deep to the cornea.

1. **Describe the three types of body sections.**

A sagittal section divides the body into left and right portions. If the portions are equal, it is called a median or midsagittal plane. If the portions are unequal, it is called a parasagittal plane.

A transverse or horizontal plane divides the body into top and bottom portions.

A frontal or coronal section divides the body into front and back portions.

1. **Name the nine regions of the abdomen.**

Epigastric, left and right hypochondriac, umbilical, left and right lateral (lumbar), pubic (hypogastric), and left and right inguinal (iliac) regions