

INTRODUCTION TO ANATOMY AND PHYSIOLOGY

An understanding of the structure (anatomy) and function (physiology) of the human body is important in the life of every individual. This chapter presents the following:

- introduction to the sciences of anatomy and physiology
- anatomical organization and terminology

ANATOMY AND PHYSIOLOGY

ANATOMY

Anatomy is the study of structure and structural relationships of the body and / or its parts. Anatomy includes many different divisions such as:

Cellular anatomy

Cellular anatomy is the study of the structure of the cell. Cellular anatomy is a branch of **cytology**, the study of the structure, function, pathology, life cycles, and life history of cells.

Developmental anatomy

Developmental anatomy is the study of the structural development of the embryo. Developmental anatomy is a branch of embryology, the study of the structure and development of the embryo.

Gross anatomy

Gross anatomy is the study of structures which can be seen with the unaided eye (the macroscopic structure of tissues and organs).

Histological anatomy

Histological anatomy is the study of the structure of tissues. **Histology** is the study of the structure, as seen microscopically, and function of tissues.

Microscopic anatomy

Microscopic anatomy is the study of structures with the aid of a microscope. Microscopic anatomy includes the structural study of cells and tissues.

Regional anatomy

Regional anatomy is the study of specific portions of the body (regions).

Systemic anatomy

Systemic anatomy is the study of the structure of the body's systems.

Surface anatomy

Surface anatomy is the study of the structure of the body's surface.

ANSWER WORKSHEET QUESTIONS

PHYSIOLOGY

Physiology is the study function of the living body and/or its parts. Physiology includes many divisions such as:

Cell physiology

Cell physiology is the study of the function of cells (a branch of cytology).

Pathology

Pathology is the study of disordered functions or disease.

Systemic physiology

Systemic physiology is the study of the function of the body's systems.

Special (organ) physiology

Special (organ) physiology is the study of specific organs of the body.

COMPLEMENTARITY

Structure (anatomy) and function (physiology) of the human body have complementarity. Complementarity refers to the interrelationship of structure (anatomy) and function (physiology). Complementarity is seen in all aspects of human anatomy and physiology and is important in understanding how the body or a structure works in a particular way.

ANSWER WORKSHEET QUESTIONS

ORGANIZATIONAL LEVELS

One approach to the structural and functional study of the body is to organize the body into the following six hierarchical levels:

(1) CHEMICAL LEVEL of organization

The chemical level is the lowest level of organization. Atoms (such as ions of sodium, potassium, calcium, etc.), molecules (such as carbohydrates, lipids, proteins, nucleic acids, etc.), and their chemical interactions play an essential role in the structural and functional aspects of the cell.

(2) CELLULAR LEVEL of organization

Cells are dependent upon the structural and functional aspects of their chemistry and are the building blocks of tissues. According to the cell theory,

- all living things are made of cells,
- cells are the basic units of life, and
- cells come only from preexisting cells.

(3) TISSUE LEVEL of organization

Tissues are groups of similar cells united to perform a particular function and are the building blocks of organs. There are four fundamental groups of tissues:

- epithelial tissue,
- connective tissue,
- muscular tissue, and
- neural tissue.

(4) ORGAN LEVEL of organization

Organs are formed from the organization of several tissues that enable it to perform a particular function. Organs are the building blocks of systems.

(5) ORGAN SYSTEM LEVEL of organization

Organ systems are formed from the interaction of associated organs. Systems are the building blocks of the organism. There are eleven systems of the body that work together to form the structural and functional components of the organism, the individual.

(6) ORGANISM LEVEL

The organism is the highest level of organism and is organized from the following eleven organ systems.

SYSTEMS OF THE BODY

Cardiovascular system

Components: Heart, blood vessels, and blood.

Functions: Transport of blood; including cells, nutrients, wastes, gases, hormones, etc.

Digestive system

Components: Digestive tract which includes mouth, esophagus, stomach, small intestine, large intestine, anus, and accessory organs such as salivary gland, pancreas, liver and gallbladder

Functions: Processing and absorption of nutrients

Endocrine system

Components: Organs which produce hormones (chemical messengers) which include pituitary, thyroid, thymus, testes, ovaries, etc.

Functions: Long-term regulation of systems by production and release of hormone

Integumentary system

Components: Includes the skin, hair, nails, sweat glands and oil glands

Functions: Protection (by skin, hair, etc.), site of sensory receptors, involved in body temperature control, etc.

Lymphatic system

Components: Includes lymph nodes, lymphatic vessels and their fluid called lymph, tonsils, spleen, and thymus

Functions: Production of lymphocytes for immunity, and collects, filters, and transports fluid (lymph)

Muscular system

Components: Includes the skeletal muscles

Functions: Movement of the body and involved in body temperature regulation

Nervous system

Components: Includes the brain, spinal cord, nerves, and receptors

Functions: Immediate control of systems, personality, emotions, etc.

Reproductive system

Components: Male: Includes testes, ductus (vas) deferens, prostate, seminal vesicles, penis. Female: Includes ovaries, fallopian tubes, uterus, and vagina.

Functions: Production of gametes (sperm, egg), implantation and development

Respiratory system

Components: Includes the nasal cavity, voice box (larynx), windpipe (trachea), and lungs

Functions: Delivery of air to lungs for oxygen and carbon dioxide exchange

Skeletal system

Components: Bones which form the skeleton

Functions: Includes the skeleton which supports, protects, provides for storage of calcium, and serves as a site of blood cell production

Urinary system

Components: Includes the kidneys, ureters, urinary bladder, and urethra

Functions: Includes the production, storage, and elimination of urine, which involves regulation of water, electrolytes, and blood pH.

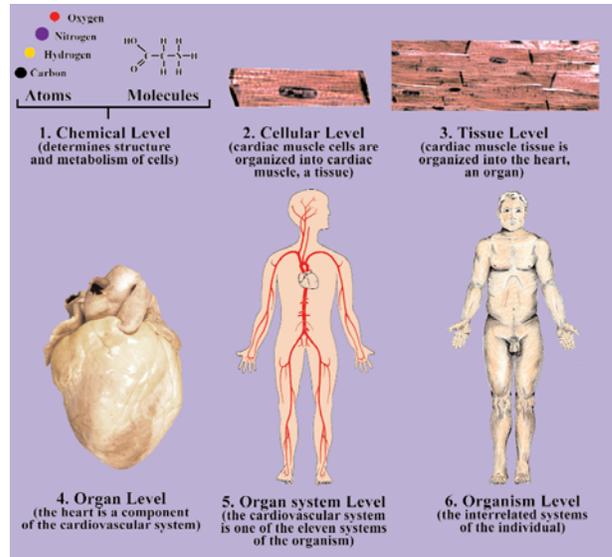


Figure 1.1

The six hierarchical levels of organization

ANSWER WORKSHEET QUESTIONS

CHARACTERISTICS OF HUMAN LIFE

Among the characteristics of the living human body are the following six processes:

- **metabolism**
- **growth**
- **differentiation**
- **responsiveness**
- **movement**
- **reproduction**

METABOLISM

Metabolism is generally defined as the **sum of all the physical and chemical processes that pertain to the body's chemistry**. The two major phases of metabolism are catabolism and anabolism.

Catabolism

Catabolism is the **destructive phase of metabolism**. Catabolism involves the breakdown of large substances into smaller units. One example of catabolism is the digestion of large protein molecules into their smaller building blocks called amino acids. Another example of catabolism is the complete consumption of a simple sugar, glucose, by its conversion to carbon dioxide and water with the transfer of energy to other molecules that drive reactions necessary for the normal functioning of cells.

Anabolism

Anabolism is the **constructive phase of metabolism**. Usually, we think of anabolism as the process of building molecules from smaller units derived from the catabolism of nutrients. One example is the building of large structural and functional proteins from amino acids (obtained from the catabolism of proteins in our foods).