

# Summary of Chapter 1

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September 2022

## 1 Anatomy and Physiology Defined

Anatomy is the science of body structures and the relationships among them. Physiology is the science of body functions—how the body parts work.

## 2 Levels of Structural Organization and Body Systems

### 1. Chemical level

This very basic level can be compared to the letters of the alphabet and includes atoms, the smallest units of matter that participate in chemical reactions, and molecules, two or more atoms joined together.

### 2. Cellular level

Molecules combine to form cells, the basic structural and functional units of an organism that are composed of chemicals. Just as words are the smallest elements of language that make sense, cells are the smallest living units in the human body.

### 3. Tissue level

Tissues are groups of cells and the materials surrounding them that work together to perform a particular function, similar to the way words are put together to form sentences. There are just four basic types of tissues in your body: epithelial tissue, connective tissue, muscular tissue, and nervous tissue.

4. Organ level

At the organ level, different types of tissues are joined together. Similar to the relationship between sentences and paragraphs, organs are structures that are composed of two or more different types of tissues; they have specific functions and usually have recognizable shapes.

5. System level

A system consists of related organs (paragraphs) with a common function. An example of the system level, also called the organ-system level, is the digestive system, which breaks down and absorbs food.

6. Organismal level

An organism, any living individual, can be compared to a book in our analogy. All the parts of the human body functioning together constitute the total organism.

### **3 Characteristics of the Living Human Organism**

#### **3.1 Basic Life Processes**

1. Metabolism

It is the sum of all chemical processes that occur in the body.

2. Responsiveness

It is the body's ability to detect and respond to changes.

3. Movement

It includes motion of the whole body, individual organs, single cells, and even tiny structures inside cells.

4. Growth

It is an increase in body size that results from an increase in the size of existing cells, an increase in the number of cells, or both.

#### 5. Differentiation

It is the development of a cell from an unspecialized to a specialized state.

#### 6. Reproduction

It refers either to (1) the formation of new cells for tissue growth, repair, or replacement, or (2) the production of a new individual.

## 4 Homeostasis

Homeostasis is the maintenance of relatively stable conditions in the body's internal environment.

### 4.1 Homeostasis and Body Fluids

An important aspect of homeostasis is maintaining the volume and composition of body fluids, dilute, watery solutions containing dissolved chemicals that are found inside cells as well as surrounding them.

### 4.2 Control of Homeostasis

A feedback system or, feedback loop, is a cycle of events in which the status of a body condition is monitored, evaluated, changed, remonitored, reevaluated, and so on.

1. A receptor is a body structure that monitors changes in a controlled condition and sends input to a control center
2. A control center in the body, for example, the brain, sets the narrow range or set point within which a controlled condition should be maintained, evaluates the input it receives from receptors, and generates output commands when they are needed.
3. An effector is a body structure that receives output from the control center and produces a response or effect that changes the controlled condition.

A **negative feedback system** reverses a change in a controlled condition. Unlike a negative feedback system, a **positive feedback system** tends to strengthen or reinforce a change in one of the body's controlled conditions.

### 4.3 Homeostatic Imbalances

A disorder is any abnormality of structure or function. Disease is a more specific term for an illness characterized by a recognizable set of signs and symptoms.

## 5 Basic Anatomical Terminology

### 5.1 Body Positions

Descriptions of any region or part of the human body assume that it is in a standard position of reference called the anatomical position. Two terms describe a reclining body. If the body is lying facedown, it is in the prone position. If the body is lying faceup, it is in the supine position.

### 5.2 Regional Names

The human body is divided into several major regions that can be identified externally. The principal regions are the head, neck, trunk, upper limbs, and lower limbs.

### 5.3 Directional Terms

To locate various body structures, anatomists use specific directional terms, words that describe the position of one body part relative to another.

### 5.4 Planes and Sections

We also study parts of the body relative to planes, imaginary flat surfaces that pass through the body parts.

## **5.5 Body Cavities**

Body cavities are spaces that enclose internal organs. Bones, muscles, ligaments, and other structures separate the various body cavities from one another. Cavities include cranial cavity, thoracic cavity, pericardial cavity, pleural cavities and abdominopelvic cavity.

## **5.6 Abdominopelvic Regions and Quadrants**

To describe the location of the many abdominal and pelvic organs more easily, anatomists and clinicians use two methods of dividing the abdominopelvic cavity into smaller areas. In the first method, two horizontal and two vertical lines, aligned like a tic-tac-toe grid, partition this cavity into nine abdominopelvic regions. The second method is simpler and divides the abdominopelvic cavity into quadrants.

# **6 Aging and Homeostasis**

Aging is a normal process characterized by a progressive decline in the body's ability to restore homeostasis. Aging produces observable changes in structure and function and increases vulnerability to stress and disease. The changes associated with aging are apparent in all body systems.

# **7 Medical Imaging**

Medical imaging refers to techniques and procedures used to create images of the human body. Various types of medical imaging allow visualization of structures inside our bodies and are increasingly helpful for precise diagnosis of a wide range of anatomical and physiological disorders. The grandparent of all medical imaging techniques is conventional radiography (x-rays).