

ANATOMY & PHYSIOLOGY ONLINE COURSE - SESSION 2 – ORGANIZATION OF THE BODY



Human beings are arguably the most complex organisms on this planet. Imagine billions of microscopic parts, each with its own identity, working together in an organized manner for the benefit of the total being. The human body is a single structure but it is made up of billions of smaller structures of four major kinds:

Cells

Cells have long been recognized as the simplest units of living matter that can maintain life and reproduce themselves. The human body, which is made up of numerous cells, begins as a single, newly fertilized cell.

Tissues

Tissues are somewhat more complex units than cells. By definition, a tissue is an organization of a great many similar cells with varying amounts and kinds of nonliving, intercellular substance between them.

Organs

Organs are more complex units than tissues. An organ is an organization of several different kinds of tissues so arranged that together they can perform a special function. For example, the stomach is an organization of muscle, connective, epithelial, and nervous tissues. Muscle and connective tissues form its wall, epithelial and connective tissues form its lining, and nervous tissue extends throughout both its wall and its lining.

Systems

Systems are the most complex of the component units of the human body. A system is an organization of varying numbers and kinds of organs so arranged that together they can perform complex functions for the body. Ten major systems compose the human body:

- Skeletal
- Muscular
- Nervous
- Endocrine
- Cardiovascular
- Lymphatic
- Respiratory
- Digestive
- Urinary
- Reproductive

Body Functions

Body functions are the physiological or psychological functions of body systems. The body's functions are ultimately its cells' functions. Survival is the body's most important business. Survival depends on the body's maintaining or restoring homeostasis, a state of relative constancy, of its internal environment.



More than a century ago, French physiologist, Claude Bernard (1813-1878), made a remarkable observation. He noted that body cells survived in a healthy condition only when the temperature, pressure, and chemical composition of their environment remained relatively constant. Later, an American physiologist, Walter B. Cannon (1871-1945), suggested the name homeostasis for the relatively constant states maintained by the body. Homeostasis is a key word in modern physiology. It comes from two Greek words - "homeo," meaning the same, and "stasis," meaning standing.

"Standing or staying the same" then is the literal meaning of homeostasis. However, as Cannon emphasized, homeostasis does not mean something set and immobile that stays exactly the same all the time. In his words, homeostasis "means a condition that may vary, but which is relatively constant."

Homeostasis depends on the body's ceaselessly carrying on many activities. Its major activities or functions are responding to changes in the body's environment, exchanging materials between the environment and cells, metabolizing foods, and integrating all of the body's diverse activities.

The body's ability to perform many of its functions changes gradually over the years. In general, the body performs its functions least well at both ends of life - in infancy and in old age. During childhood, body functions gradually become more and more efficient and effective. During late maturity and old age the opposite is true. They gradually become less and less efficient and effective. During young adulthood, they normally operate with maximum efficiency and effectiveness.

Life Process

All living organisms have certain characteristics that distinguish them from non-living forms. The basic processes of life include organization, metabolism, responsiveness, movements, and reproduction. In humans, who represent the most complex form of life, there are additional requirements such as growth, differentiation, respiration, digestion, and excretion. All of these processes are interrelated. No part of the body, from the smallest cell to a complete body system, works in isolation. All function together, in fine-tuned balance, for the well being of the individual and to maintain life. Disease such as cancer and death represent a disruption of the balance in these processes.



The following is a brief description of the life process:

Organization

At all levels of the organizational scheme, there is a division of labor. Each component has its own job to perform in cooperation with others. Even a single cell, if it loses its integrity or organization, will die.

Metabolism

Metabolism is a broad term that includes all the chemical reactions that occur in the body. One phase of metabolism is catabolism in which complex substances are broken down into simpler building blocks and energy is released.

Responsiveness

Responsiveness or irritability is concerned with detecting changes in the internal or external environments and reacting to that change. It is the act of sensing a stimulus and responding to it.

Movement

There are many types of movement within the body. On the cellular level, molecules move from one place to another. Blood moves from one part of the body to another. The diaphragm moves with every breath. The ability of muscle fibers to shorten and thus to produce movement is called contractility.

Reproduction

For most people, reproduction refers to the formation of a new person, the birth of a baby. In this way, life is transmitted from one generation to the next through reproduction of the organism. In a broader sense, reproduction also refers to the formation of new cells for the replacement and repair of old cells as well as for growth. This is cellular reproduction. Both are essential to the survival of the human race.

Growth

Growth refers to an increase in size either through an increase in the number of cells or through an increase in the size of each individual cell. In order for growth to occur, anabolic processes must occur at a faster rate than catabolic processes.

Differentiation

Differentiation is a developmental process by which unspecialized cells change into specialized cells with distinctive structural and functional characteristics. Through differentiation, cells develop into tissues and organs.

Respiration

Respiration refers to all the processes involved in the exchange of oxygen and carbon dioxide between the cells and the external environment. It includes ventilation, the diffusion of oxygen and carbon dioxide, and the transport of the gases in the blood. Cellular respiration deals with the cell's utilization of oxygen and release of carbon dioxide in its metabolism.

Digestion

Digestion is the process of breaking down complex ingested foods into simple molecules that can be absorbed into the blood and utilized by the body.

Excretion

Excretion is the process that removes the waste products of digestion and metabolism from the body. It gets rid of by-products that the body is unable to use, many of which are toxic and incompatible with life.

The ten life processes described above are not enough to ensure the survival of the individual. In addition to these processes, life depends on certain physical factors from the environment. These include water, oxygen, nutrients, heat, and pressure.

Directional Terms

Directional terms describe the positions of structures relative to other structures or locations in the body.

Superior or cranial

toward the head end of the body; upper (example, the hand is part of the superior extremity).

Inferior or caudal

away from the head; lower (example, the foot is part of the inferior extremity).

Anterior or ventral

front (example, the kneecap is located on the anterior side of the leg).

Posterior or dorsal

back (example, the shoulder blades are located on the posterior side of the body).

Medial

toward the midline of the body (example, the middle toe is located at the medial side of the foot).

Lateral

away from the midline of the body (example, the little toe is located at the lateral side of the foot).

Proximal

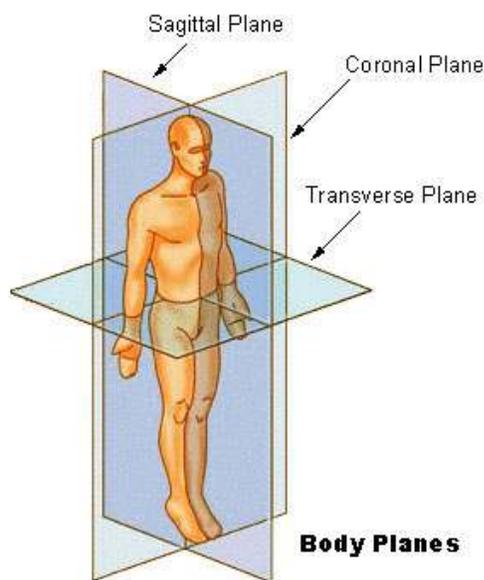
toward or nearest the trunk or the point of origin of a part (example, the proximal end of the femur joins with the pelvic bone).

Distal

away from or farthest from the trunk or the point or origin of a part (example, the hand is located at the distal end of the forearm).

Planes of the Body

Medical professionals often refer to sections of the body in terms of anatomical planes (flat surfaces). These planes are imaginary lines – vertical or horizontal - drawn through an upright body. The terms are used to describe a specific body part.



Coronal Plane (Frontal Plane)

A vertical plane running from side to side; divides the body or any of its parts into anterior and posterior portions.

Sagittal Plane (Lateral Plane)

A vertical plane running from front to back; divides the body or any of its parts into right and left sides.

Axial Plane (Transverse Plane)

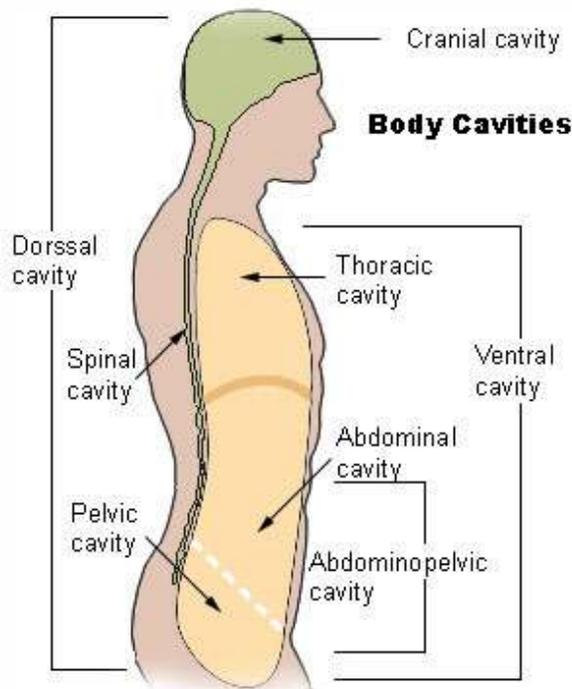
A horizontal plane; divides the body or any of its parts into upper and lower parts.

Median plane

Sagittal plane through the midline of the body; divides the body or any of its parts into right and left halves.

Body Cavities

The cavities, or spaces, of the body contain the internal organs, or viscera. The two main cavities are called the ventral and dorsal cavities. The ventral is the larger cavity and is subdivided into two parts (thoracic and abdominopelvic cavities) by the diaphragm, a dome-shaped respiratory muscle.



Thoracic cavity

The upper ventral, thoracic, or chest cavity contains the heart, lungs, trachea, esophagus, large blood vessels, and nerves. The thoracic cavity is bound laterally by the ribs (covered by costal pleura) and the diaphragm caudally (covered by diaphragmatic pleura).

Abdominal and pelvic cavity

The lower part of the ventral (abdominopelvic) cavity can be further divided into two portions: abdominal portion and pelvic portion. The abdominal cavity contains most of the gastrointestinal tract as well as the kidneys and adrenal glands. The abdominal cavity is bound cranially by the diaphragm, laterally by the body wall, and caudally by the pelvic cavity. The pelvic cavity contains most of the urogenital system as well as the rectum. The pelvic cavity is bounded cranially by the abdominal cavity, dorsally by the sacrum, and laterally by the pelvis.

Dorsal cavity

The smaller of the two main cavities is called the dorsal cavity. As its name implies, it contains organs lying more posterior in the body. The dorsal cavity, again, can be divided into two portions. The upper portion, or the cranial cavity, houses the brain, and the lower portion, or vertebral canal houses the spinal cord.

Session Review

Here is what we have learned from this session:

- The human body is a single structure but it is made up of billions of smaller structures of four major kinds: cells, tissues, organs, and systems.
- An organ is an organization of several different kinds of tissues so arranged that together they can perform a special function.
- A system is an organization of varying numbers and kinds of organs so arranged that together they can perform complex functions for the body.
- Ten major systems include the skeletal, muscular, nervous, endocrine, cardiovascular, lymphatic, respiratory, digestive, urinary, and the reproductive system.
- Body functions are the physiological or psychological functions of body systems. Survival of the body depends on the body's maintaining or restoring homeostasis, a state of relative constancy, of its internal environment.
- Human life process includes organization, metabolism, responsiveness, movements, reproduction, growth, differentiation, respiration, digestion, and excretion. All these processes work together, in fine-tuned balance, for the well-being of the individual and to maintain life.
- Life depends on certain physical factors from the environment, which include water, oxygen, nutrients, heat, and pressure.
- Useful terms for describing body parts and activities include: Directional terms, Terms describing planes of the body, and Terms describing body cavities

ANATOMY AND PHYSIOLOGY ONLINE COURSE - SESSION 2 - QUESTION & ANSWERS

NAME: _____

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PHONE: _____

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Please be sure to fill out the information above, complete the test and e-mail or fax it back to us at iridology@netzero.net or 530-878-1119. We will grade your question & answer session and will let you know if we have questions or comments.

Choose the one best answer for each of the following:

- _____ do not belong to the four basic human body structure units.
 - Cells.
 - Differentiation
 - Tissues
 - Systems
- An American physiologist, Walter B. Cannon suggested the name _____ for the relatively constant states maintained by the body.
 - homosapien
 - homogenization
 - homology
 - homeostasis
- The word homeostasis is derived from _____.
 - Greek
 - Latin
 - Sanskrit
 - German
- One of the additional requirements specific to the basic processes of human life is _____.
 - organization
 - differentiation
 - metabolism
 - responsiveness
- One phase of metabolism is _____ in which complex substances are broken down into simpler building blocks and energy is released.
 - organization
 - responsiveness
 - catabolism
 - growth
- Responsiveness or _____ is concerned with detecting changes in the internal or external environments and reacting to that change.
 - flexibility
 - contractility
 - irritability
 - responsibility
- The word caudal is a directional term that indicates "_____".
 - toward the head end of the body
 - away from the head
 - toward the midline of the body
 - away from the midline of the body

8. The hand is located at the _____ end of the forearm.
- A. proximal
 - B. medial
 - C. interior
 - D. distal
9. Coronal plane runs _____, dividing the body or any of its parts into anterior and posterior portions.
- A. crosswise
 - B. from front to back
 - C. from side to side
 - D. through midline
10. The _____ cavity contains the heart, lungs, trachea, esophagus, large blood vessels, and nerves.
- A. dorsal
 - B. abdominopelvic
 - C. cranial
 - D. thoracic