

UNIT 1 – BODY PLAN AND ORGANIZATION

LECTURE

1.03 CONTRAST THE SCIENCES OF ANATOMY AND PHYSIOLOGY

A. Anatomy

Anatomy is the scientific study of structures and the relationship of structures to each other. (FORM)

B. Physiology

Physiology is the scientific study of how body structures and systems function to perform life processes. (FUNCTION)

1.04 LEVELS OF STRUCTURAL ORGANIZATION

A. Chemical Level

The chemical level includes all elements (atoms) and molecules essential for maintaining life. Examples of the four most common elements in the body include: (C) carbon, (H) hydrogen, (O) oxygen and (N) nitrogen. Examples of molecules include glucose and water.

B. Cellular Level

The cell is the basic unit of structure and function. Each cell has a unique shape and function. Some examples of cells include eggs (ova), spermatozoa, muscle cells, nerve cells, and blood cells.

C. Tissue Level

Tissues are groups of similar cells found together performing a specific function. The four primary tissue types include: epithelial, connective, muscle, and nervous.

D. Organ Level

Organs are structures composed of two or more different tissues having specific functions and recognizable shapes. Some examples of organs include the heart, brain, kidneys, and liver.

E. System Level

Systems are groups of organs which work together for a common function. Some examples include the digestive, cardiovascular, nervous, and lymphatic systems.

F. Organism Level

An organism is a group of organ systems which function together to meet the needs of the individual.

1.05 METABOLISM

A. Definition

Metabolism is the total of all chemical processes that occur in the body. Metabolism refers specifically to the two processes associated with converting nutrients into energy.

1. Anabolism

Anabolism uses energy to synthesize or manufacture new cells, tissues or molecules.

2. Catabolism

Catabolism is the breakdown of tissues or chemicals to produce energy.

1.06 DIRECTIONAL TERMS

These terms will help to standardize discussion about locations and directions of the body.

- A. Posterior – to the back
- B. Anterior – to the front
- C. Medial – towards the middle
- D. Lateral – towards the side
- E. Proximal – closest to the trunk or main part of the body
- F. Distal – away from the trunk or the main part of the body
- G. Superficial – towards the surface
- H. Deep – away from the surface
- I. Superior – above
- J. Inferior -- below

[These additional directional terms are found in the Medical Terminology competency, and are provided here for the convenience of the teacher.](#)

Directional terms are used to describe joint movements that occur in different directions and planes. The body is assumed to be in anatomical position; standing erect, the face forward, and the arms at the sides with the palms forward. A person may be lying down in anatomical position. The person is supine when lying on the back, face up or prone when lying face down on the abdomen.

A. Abduction

Moving a body part away from the midline.

B. Adduction

Moving a body part toward the midline.

C. Circumduction

Moving a body part in a circular motion.

D. Depression

Lowering a body part.

E. Dorsiflexion

Bending the foot upward by flexing the foot at the ankle.

- F. Elevation
Raising a body part.
- G. Eversion
Turning the foot so the sole is outward.
- H. Extension
Increasing the joint angle to straighten body parts.
- I. Flexion
Decreasing the joint angle to bring two body parts closer together.
- J. Hyperextension
Excessive extension of body parts at a joint; moving a part beyond normal anatomical position.
- K. Inversion
Turning the foot so the sole of the foot is inward.
- L. Plantar flexion
Bending the foot downward by extending the foot at the ankle.
- M. Pronation
Turning the hand with the palm down or turning the foot so the medial margin is lowered.
- N. Protraction
Moving a body part forward.
- O. Retraction
Moving a body part backward.
- P. Supination
Turning the hand with the palm upward or turning the foot so the medial margin is raised.

1.07 BODY PLANES

Body planes refer to any slice or cut through a three-dimensional structure allowing us to visualize relationships between those parts. CT (Computed Tomography Imaging) and MRI (Magnetic Resonance Imaging) technology use these principles.

- A. Sagittal Plane
The sagittal plane is a vertical plane (lengthwise) dividing the body or an organ into right and left sections.
- B. Midsagittal Plane
The midsagittal plane is a vertical plane (lengthwise) dividing the body or an organ into equal right and left halves.
- C. Transverse (Cross-Section, Horizontal)
The transverse plane is a horizontal plane dividing the body or an organ into superior (upper) and inferior (lower) sections.

D. Frontal (Coronal)

The frontal plane is a vertical plane dividing the body or an organ into anterior (front) and posterior (back) sections.

1.08 BODY CAVITIES

Body cavities are openings within the torso which contain organs, protect delicate organs from accidental shocks and bumps, and permit the expansion and contraction of organs without disrupting the activities of other organs.

A. Dorsal Cavity

The dorsal cavity is located on the posterior/dorsal surface of the body and surrounds the brain and the spinal cord.

1. Spinal (Vertebral) Cavity

The spinal cavity is formed by the vertebrae of the spine and surrounds spinal cord..

2. Cranial Cavity

The bones of the skull create the cranial cavity to protect the brain.

B. Ventral Cavity

The ventral cavity is located on the anterior/ventral surface of the body and contains the thoracic cavity and the abdominopelvic cavity. The walls of the cavities are composed of skin, muscle, connective tissue, bone (for two cavities), and the serous membrane.

1. Thoracic Cavity

The thoracic cavity is the portion of ventral cavity superior to the diaphragm.

a. Pleural Cavities

The pleural cavities are the spaces surrounding each lung.

b. Mediastinum

The mediastinum is the broad, middle tissue mass of the thoracic cavity dividing the lungs into two cavities. It includes the aorta, other great blood vessels, esophagus, trachea, thymus, pericardial cavity, and heart.

c. Pericardial Cavity

The pericardial cavity is the space in which the heart is located.

2. Abdominopelvic Cavity

The abdominopelvic cavity is portion of the ventral cavity inferior to the diaphragm.

a. Abdominal Cavity

(1) The abdominal cavity is the superior portion of the abdominopelvic cavity. It extends from the diaphragm to the superior margin of the pelvic girdle.

- (2) The abdominal cavity contains the organs known as the viscera. The organs include the stomach, spleen, liver, gallbladder, pancreas, small intestines, and most of the large intestine.
- b. Pelvic Cavity
 - (1) The pelvic cavity is surrounded by the pelvic bones.
 - (2) The pelvic cavity contains the urinary bladder, cecum, appendix, sigmoid colon, rectum, intestines, and the male or female internal reproductive organs.

1.09. ABDOMINOPELVIC QUADRANTS

A. Abdominopelvic Quadrants

The abdominopelvic quadrants are imaginary lines intersecting through the umbilicus to divide the abdominopelvic cavity into four areas. The quadrants are used by clinical personnel to describe the location of abdominopelvic pain, tumors, or other abnormalities.

- 1. Right Upper Quadrant (RUQ)
 - a. Liver
 - b. Right Kidney
 - c. Gallbladder
- 2. Left Upper Quadrant (LUQ)
 - a. Spleen
 - b. Stomach
 - c. Left Kidney
- 3. Right Lower Quadrant (RLQ)
 - a. Cecum
 - b. Appendix
 - c. Right Ovary
- 4. Left Lower Quadrant (LLQ)
 - Left ovary

1.10. EXAMINE THE RELATIONSHIP BETWEEN HOMEOSTASIS AND STRESS

A. Homeostasis

Homeostasis is the body's ability to maintain a stable internal environment despite changes that occur internally or externally.

B. Stress

Stress is an imbalance in the body's internal environment. A stressor is something that causes stress and may be physical (illness or injury), emotional (such as bipolar disorder or obsessive compulsive disorder), metabolic (starvation), or environmental (heat, cold). Stressors may be further classified as external or internal.

1. External stressors: heat, cold, noise, light, exercise
2. Internal stressors: pain, tumors, hypertension, chemicals

1.11 DIFFERENTIATE BETWEEN POSITIVE AND NEGATIVE FEEDBACK MECHANISMS

A. Components of Feedback Mechanisms

Feedback mechanisms function continuously to monitor the level of chemicals, molecules, gases, pressure, pH, nutrients, glucose, water, temperature, and other vital parameters. The feedback model contains the following components:

1. Stimulus
Any stress that changes a controlled condition.
2. Receptor
Monitors changes in the controlled condition and sends information (Input) to the control center.
3. Control Center
An area in the body that receives information about the status of a controlled condition from a receptor and determines an appropriate course of action.
4. Effector
Receives information from the control center and produces a response.
5. Response
The action of the effector.

B. Types of Feedback Mechanisms

1. **Negative Feedback Mechanisms (Inhibitory)**

The reaction of the body (output) counteracts the stress (input) in order to restore homeostasis. Simply stated, negative feedback mechanisms reverse the effects of the change. EXAMPLE: Blood Glucose. Blood glucose normally ranges between 80 milligrams and 120 milligrams in a blood sample. When we eat, our blood sugar rises above normal levels. This causes insulin to be released from the pancreas to facilitate the movement of glucose from the blood and into the body cells. The blood sugar level drops back to the normal. Examples of other negative feedback mechanisms include regulation of blood pressure, body temperature, and water balance. (For other examples, refer to the endocrine system).

2. **Positive Feedback Mechanisms (Stimulatory)**

The reaction of the body (output) is stimulated or intensified by the input. In other words, the response enhances the stimulus. EXAMPLE: Breast feeding shows the hormonal control of milk let-down by a suckling infant. Other non-lethal examples of positive feedback mechanisms include labor contractions and blood clotting.