HUMAN ANATOMY AND PHYSIOLOGY

INTRODUCTION TO HUMAN ANATOMY AND PHYSIOLOGY

What are Anatomy and Physiology?

- Anatomy: the word anatomy is derived from a Greek word “Anatome” meaning to cut up. It is the study of structures that make up the body and how those structures relate with each other.
- The study of anatomy includes many sub specialties. These are Gross anatomy, Microscopic anatomy, Developmental anatomy and Embryology.

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- **Gross anatomy** studies body structure with out microscope. Systemic anatomy studies functional relationships of organs within a system whereas Regional anatomy studies body part regionally. Both systemic and regional approaches may be used to study gross anatomy.

- **Microscopic anatomy (Histology)** requires the use of microscope to study tissues that form the various organs of the body.

INTRODUCTION TO HUMAN ANATOMY AND PHYSIOLOGY

- Physiology: the word physiology derived from a Greek word for study of nature. It is the study of how the body and its part work or function.

- Hence, Anatomy and physiology are studied together to give students a full appreciation and understanding of human body.

Homeostasis

- When structure and function are coordinated the body achieves a relative stability of its internal environment called homeostasis / staying the same. Although the external environmental changes constantly, the internal environment of a healthy body remains the same with in normal limits.

- “BALANCE OF SYSTEMS”

Homeostasis

- Under normal conditions, homeostasis is maintained by adaptive mechanisms ranging from control center in the brain to chemical substances called hormones that are secreted by various organs directly into the blood streams. Some of the functions controlled by homeostasis mechanisms are blood pressure, body temperature, breathing and heart rate.

Level of structural organization

- The human body has different structural levels of organization, starting with atoms molecules and compounds and increasing in size and complexity to cells, tissues, organs and the systems that make up the complete organism.

Atoms molecules and compounds:

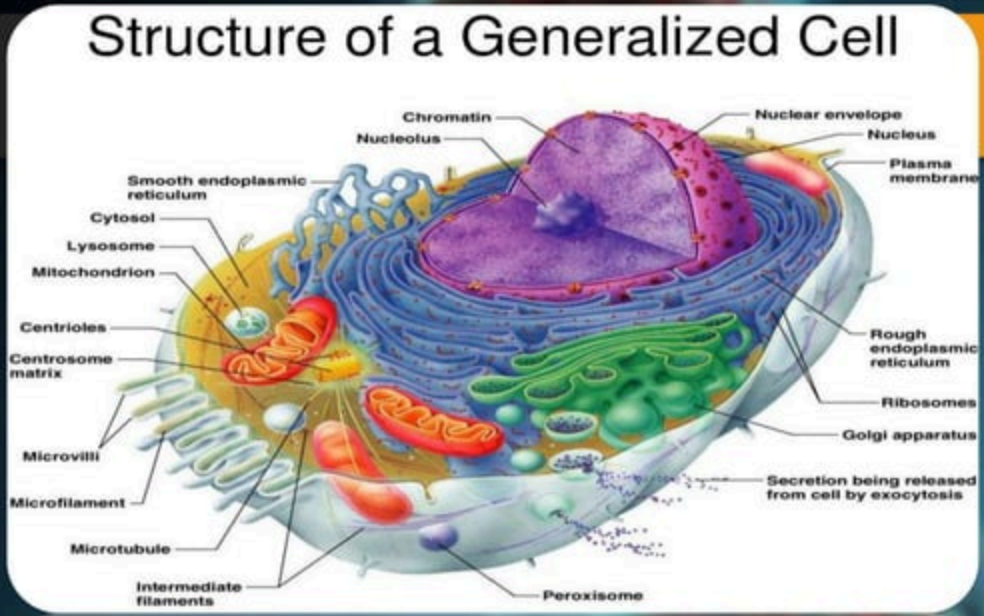
- At its simplest level, the body is composed of atoms. The most common elements in living organism are carbon, hydrogen, oxygen, nitrogen phosphorus and sulfur.

- Atoms → Molecule → Compounds.

Cell

- The smallest independent units of life. All life depends on the many chemical activities of cells. Some of the basic functions of cell are: growth, metabolism, irritability and reproduction

Cell


Structure of a Generalized Cell
Chromatin
Nucleolus
Nuclear envelope
Nucleus
Plasma membrane
Smooth endoplasmic reticulum
Cytosol
Lysosome
Mitochondrion
Centrioles
Centrosome matrix
Microvilli
Microfilament
Microtubule
Intermediate filaments
Rough endoplasmic reticulum
Ribosomes
Golgi apparatus
Secretion being released from cell by exocytosis
Peroxisome

Tissue

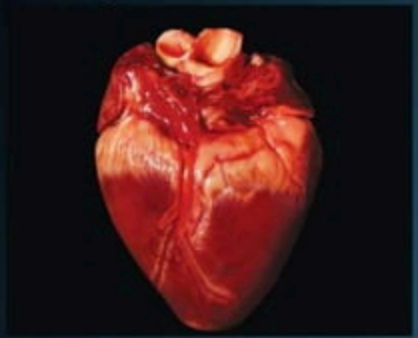
- Tissue is made up of many similar cells that perform a specific function. The various tissues of the body are divided in to four groups. These are epithelial, connective, nervous and muscle tissue.

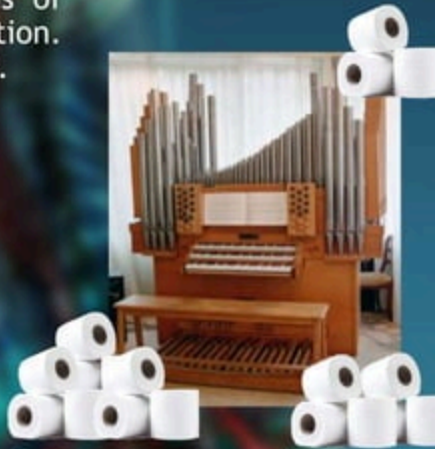
Tissue

- Epithelial tissue: - Found in the outer layer of skin, lining of organs, blood and lymph vessels and body cavities.
- Connective tissue: - Connects and supports most part of the body. They constitute most part of skin, bone and tendons.
- Muscle tissue: - Produces movement through its ability to contract. This constitutes skeletal, smooth and cardiac muscles.
- Nerve tissue: - Found in the brain, spinal cord and nerves. It responds to various types of stimuli and transmits nerve impulses.

Organs

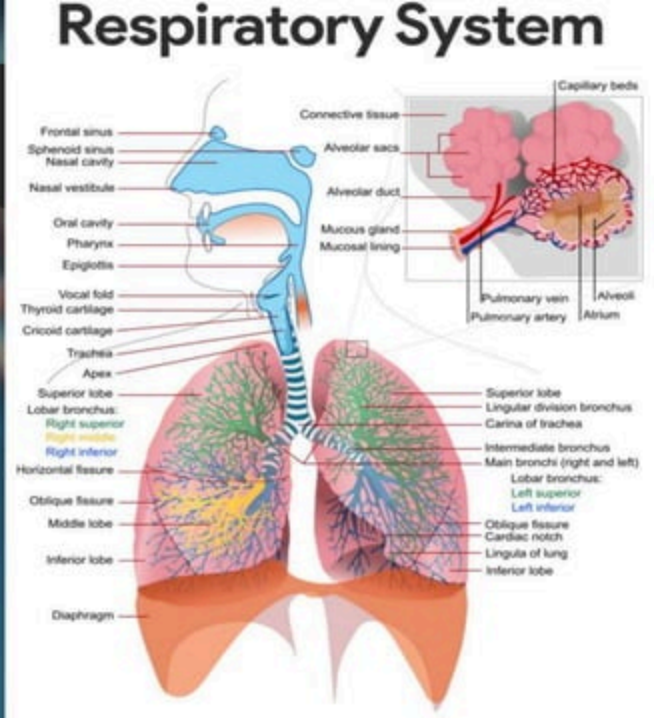
- Is an integrated collection of two or more kinds of tissue that works together to perform specific function. For example: Stomach is made of all type of tissues.
- Example: heart





Organ System

- System: Is a group of organs that work together to perform major function. For example: Respiratory system contains several organs.



Organism level

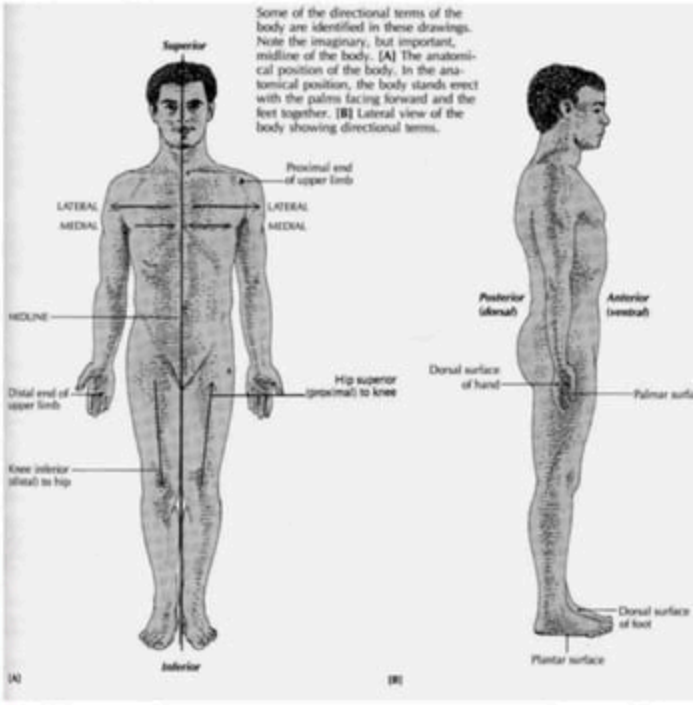
- The various organs of the body form the entire organism.

Anatomical Position

- Anatomical positions are universally accepted as the starting points for positional references to the body. In anatomical position the subject is standing erect and facing the observer, the feet are together, and the arms are hanging at the sides with the palms facing forward.

Anatomical Position

- Relative directional terms of the body.
- (Source: Carola, R., Harley,J.P., Noback R.C., (1992), Human anatomy and physiology, Mc Graw hill inc, New York, 2nd ed, pp 15)



Relative Directional terms

- Standardized terms of reference are used when anatomists describe the location of the body part. Relative means the location of one part of the body is always described in relation to another part of the body.

DIRECTIONAL TERMS	DEFINITION AND EXAMPLE
Superior (cranial)	Toward the head. The leg is supper to the foot.
Inferior (caudal)	Toward the feet. The foot is inferior to the leg.
Anterior (ventral)	Toward the front part of the body. The nose is anterior to the ears.
Posterior (dorsal)	Towards the back of the body. The ears are posterior to the nose.
Medial	Towards the midline of the body. The nose is medial to the eyes
Lateral	Away from the midline of the body. The eyes are lateral to the nose.
Proximal	Toward (nearer) the trunk of the body or the attached end of a limb. The shoulder is proximal to the wrist.
Distal	Away (farther) from the trunk of the body or the attached end of a limb. The wrist is distal to the forearm.
Superficial	Nearer the surface of the body. The ribs are superficial to the heart.
Deep	Farther from the surface of the body. The heart is deeper to the ribs.
Peripheral	Away from the central axis of the body. Peripheral nerves radiate away from the brain and spinal cord.

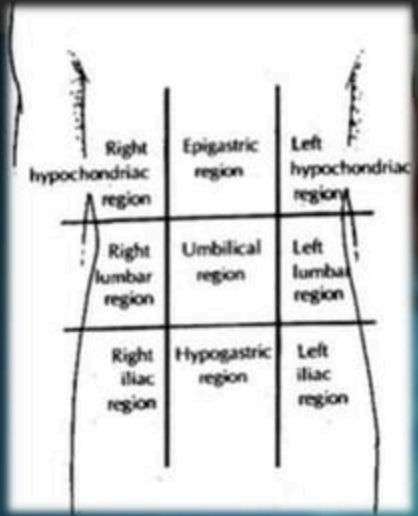
Body parts Regions

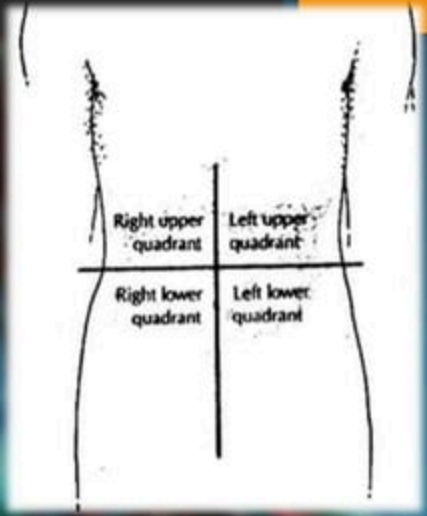
- The body can generally be described to have areas of:

- **Axial body part**: - It is the part of the body near the axis of the body. This includes head, neck, thorax (chest), abdomen, and pelvis.

Body parts Regions

- **Appendicular body part:** - It is the part of the body out of the axis line. This includes the upper and lower extremities.
- It is customary to **subdivide the abdominal area into nine regions** or more easily in to **four quadrants.**



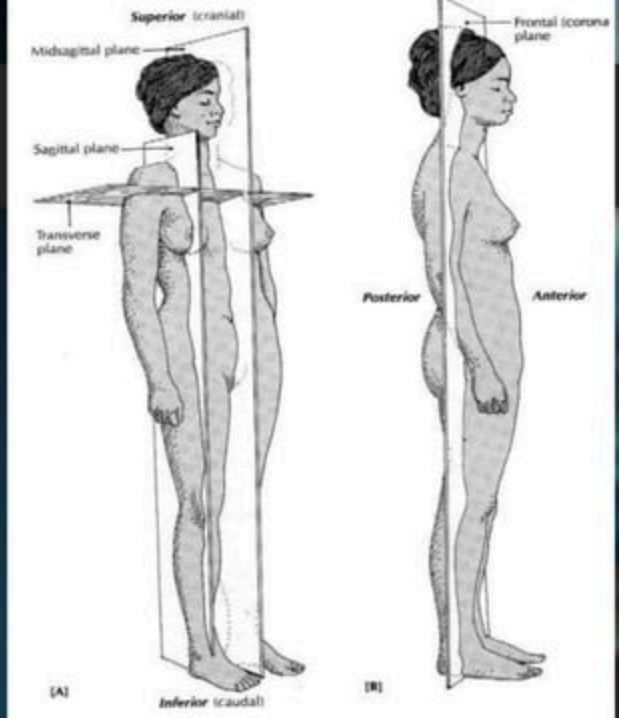


Body planes and sections

- Body planes are imaginary surfaces or planes lines that divide the body in to sections. This helps for further identification of specific areas.

Body planes and sections

- **Sagittal plane**: - divides the body into right and left half.
  - Mid sagittal plane: - divides body into equal left and right halves.
  - Para sagittal plane: - divides body into unequal left and right
- **Frontal plane**: - divides the body into asymmetrical antererior and posterior sections.
- **Transverse plane**: - divides the body into upper and lower body section.
- **Oblique plane**: - divides the body obliquely into upper and lower section.


Superior (cranial)
Midsagittal plane
Sagittal plane
Transverse plane
[A]
Inferior (caudal)
Frontal (corona) plane
Posterior
Anterior
[B]

Body Cavities

- The **cavities of the body house the internal organs**, which commonly referred to as the viscera. The two main body cavities are the larger ventral (anterior) and the smaller, dorsal (posterior) body cavity.

- **The ventral body cavity** constitutes the thoracic cavity and the abdomino-pelvic body cavity

Body Cavities

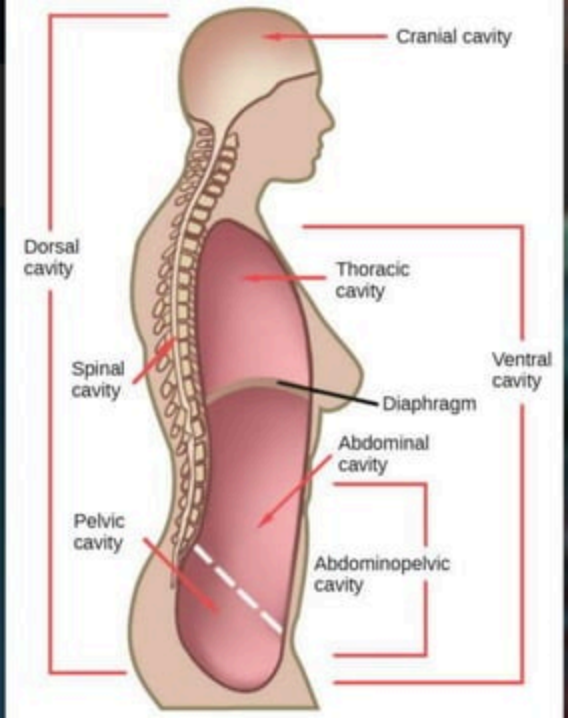
- **The Thoracic cavity** houses lung and heart. It is protected by the rib cage & associated musculature and the sternum anteriorly. It consists of the right and left pleural cavities and mediastinum (the portion of tissues and organs that separates the left and right lung).
- **Abdomino-pelvic Cavity** extends from the diaphragm inferior to the floor of the pelvis. It is divided into superior abdominal and inferior pelvic cavity by imaginary line passing at upper pelvis.

Body Cavities

- **Abdominal cavity** contains the stomach, intestine, liver, spleen and gallbladder.
- **The pelvic cavity** contains urinary bladder, rectum, and portions of the reproductive organs.

Body Cavities

- **The dorsal body cavity**: it constitutes the cephalic cavity containing brain and the vertebral canal containing the spinal cord.


Cranial cavity
Dorsal cavity
Thoracic cavity
Spinal cavity
Ventral cavity
Diaphragm
Abdominal cavity
Pelvic cavity
Abdominopelvic cavity

Review Questions

1. The anatomical term opposite to lateral is:

a) Proximal
b) Distal
c) Medial
d) Superficial
e) Caudal.

Review Questions

2. When structure and function coordinated the body gets a relative stability. This phenomenon is called

a) Anatomical integrity
b) Physiological stability
c) Homeostasis
d) Hemostasis
e) Body stasis

Review Questions

3. Which of the following is not the correct description of anatomical position?

a) Body facing forward
b) Head turned to side
c) Palms facing forward
d) Body standing
e) Feet together.

Review Questions

4. A plane that divided the body into anterior and posterior parts is:

a) Medial plane
b) Coronal or frontal plane
c) Sagital plane
d) Transverse plane
e) Oblique plane

Review Questions

5. The abdominal cavity contains the

a) Heart and lung
b) Reproductive organs and urinary bladder
c) Liver, spleen and stomach
d) Urinary bladder and lungs
e) Testes and ovaries