

HSF Compendium 1 Notes

C1 L1 – The Human Body – iLecture Notes

What is Anatomy?

- **Anatomy:** scientific discipline that investigates the structure of body parts and how they relate to each other.
- Includes the study of systems, organs, tissues, the shapes of the organs, what the organs are made of, the position in the body and their locations.

Levels of Anatomy

- **1) Gross anatomy (macroscopic):** structures examined without the aid of a microscope.
 - a) **Systemic:** body is studied system by system; e.g. integumentary system: skin, hair, nails and sweat glands, skeletal system: bones and cartilage, and muscular system: muscles
 - b) **Regional:** body is studied area by area or region by region; identify the relationship between different structures of an area; e.g. in the arm you can study the muscles, nerves and blood vessels.
- **2) Surface:** study of the external form of the body and its relation to deeper structures; e.g. using the sternum and the ribs you can identify where the heart sits.
 - Is a type of gross or macroscopic anatomy.
- **3) Microscopic:** structures examined with the aid of a microscope; common forms = cytology, histology.
 - **Cytology:** study of cells and their content; e.g. urine cytology = urine sample examined for the presence of abnormal cells.
 - **Histology:** study of tissues and the cells that make up the tissue; can be used for diagnostic purposes such as for the diagnoses of melanoma – a mole can be biopsied and viewed under a microscope to view the types of cells that make up that sample.
- **4) Developmental:** structural changes that occur in the body throughout the life span; may look at how different parts of the body develops from in utero to a fully grown adult.

What is Physiology?

- **Physiology:** study of the function of living things.

Levels of Physiology

- **Molecular:** examines the activity of molecules in a cell; e.g. proteins in a cell, protein channels in a cell membrane, receptors found on a cell membrane.
- **Cellular:** examines how cells interact and communicate with each other.
- **Systemic:** examines the physiology of the cells and tissues of the organs of body systems.
- **Neurophysiology:** examines the physiology of the nervous system.
- **Renal:** examines the physiology of the kidneys and urinary system.
- **Cardiovascular:** examines the physiology of the heart, the blood circulation and the blood vessels.

Examples of Anatomical and Physiological Studies

- Measuring the electrical conductivity of the heart = physiological.
- Viewing cells under a microscope = anatomical.
- Using a vitalograph to test respiratory function = physiological.
- Observing the interior and exterior structures of the brain = anatomical.
- Measuring blood pressure after running a race = physiological.
- Dissecting a heart = anatomical.

Organisation of the Human Body

- Atomic level -> molecular level
 - Atoms (e.g. carbon, hydrogen, oxygen, nitrogen) interact to form molecules (e.g. DNA, RNA, sugar, water).
- **Molecular level** -> cellular level
 - Molecules (e.g. DNA, RNA) combine to form organelles (e.g. nucleus, mitochondria, endoplasmic reticulum, etc.) of a cell.

- **Cellular level** -> tissue level
 - Numerous cells and organelles (e.g. smooth muscle cells) join together to form a tissue (e.g. smooth muscle tissue).
- **Tissue level** -> organ level
 - Tissues (can be more than one type, e.g. adipose, muscle, connective) form organs (e.g. bladder).
 - E.g. urinary bladder wall made up of epithelium, connective tissue, smooth muscle tissue and connective tissue.
- **Organ level** -> system level
 - One or more organs (e.g. kidneys, ureters, bladder) make up a system (e.g. urinary system).
 - Other systems: integumentary, skeletal, muscular, lymphatic, respiratory, digestive, endocrine, cardiovascular, male reproductive, female reproductive, urinary.
- **Organ system level** -> organism level
 - All different systems make up an organism; e.g. respiratory system, renal system, cardiovascular.
- **Organism**

Characteristics of Organisms

- **1) Organisation:** relationships among the parts of an organism and how those parts interact to perform specific functions; e.g. thousands of smooth muscle cells join up to make smooth muscle tissue which is just one component of those that make up the urinary bladder.
- **2) Metabolism:** chemical reactions taking place in an organism; e.g. chemical reaction to produce energy.
- **3) Responsiveness:** organism's ability to sense changes in its environment and adjust to those changes; e.g. when you are feeling cold your body responds by trying to warm itself up – does this by moving blood away from skin to the core of your body to keep the core of the body warm.
- **4) Growth:** increase in the size or the number of cells; e.g. the growing of your hair or nails.
- **5) Development:** changes an organism undergoes through time; e.g. developmental changes that a human undergoes through puberty.
- **6) Reproduction:** formation of new cells or new organisms.

Homeostasis

- **Homeostasis:** the existence and maintenance of a relatively constant environment within the body.
- Includes body temperature, blood pressure, pH, glucose, carbon dioxide, oxygen, etc.
- Homeostatic mechanisms maintain the body near an ideal normal point called the **set point**.
- Homeostasis is still maintained when small fluctuations occur above or below the set point = **normal range**.
- The failure of homeostasis can result in disease or even death.

C1 L2 – Anatomical Terminology – iLecture Notes

The Anatomical Position

- An erect person whose:
 - Face is directed forward
 - Arms are hanging by their side
 - Palms of their hands facing forward.
- The purpose is to give us a point of reference to describe the different points of the body.

Other Body Positions

- **Supine:** person lying face up.
- **Prone:** person lying face down.

Directional Terms

- **Superior:** toward the head; e.g. the head is superior to the neck, the knees are superior to the ankles.
 - Also known as cephalic or cranial.
- **Inferior:** toward the tail; e.g. the pelvis is inferior to the stomach, the lips are inferior to the eyes.
 - Also known as caudal.
- **Anterior:** toward the front; e.g. the breast is anterior to the spine, the nose is anterior to the ears.
 - Also known as ventral.
- **Posterior:** toward the back; e.g. the ankles are posterior to the toes, the ears are posterior to the lips.
 - Also known as dorsal.
- **Proximal:** nearest; e.g. the elbow is proximal to the wrist, the knees are proximal to the ankles.

- **Distal:** distant; e.g. the fingers are distal to the wrist, the elbow is distal to the shoulder.
 - Proximal and distal are used to describe linear structures such as the arms and legs.
- **Medial:** toward the mid-line of the body; e.g. the nose is medial to the eyes, the naval is medial to the ears.
- **Lateral:** away from the mid-line of the body; e.g. the ears are lateral to the lips, the shoulder is lateral to the sternum.
- **Superficial:** close to the surface of...; e.g. the epidermis is superficial to the dermis, the dermis is superficial to the muscle.
- **Deep:** towards the interior of...; e.g. the bone is deep to the adipose tissue, the muscle is deep to the dermis.

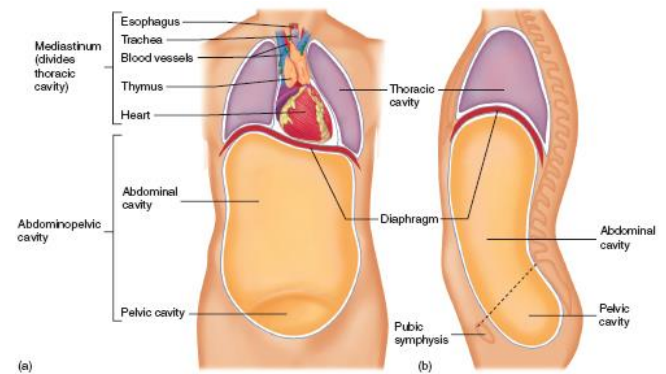
Body Planes

- **Sagittal plane:** runs vertically down the body separating the body into left and right portions.
 - A **median plane** is a sagittal plane that passes through the midline of the body, dividing it into equal right and left halves.
- **Frontal plane (coronal):** runs vertically from right to left and divides the body into anterior and posterior parts.
- **Transverse plane (horizontal):** runs parallel to the ground and divides the body into superior and inferior portions.
- **Oblique:** a plane that does not run parallel to the frontal or transverse plane.

- A cut through the long axis of the organ is a **longitudinal section**, and a cut at right angle to the long axis is a **transverse (cross) section**. If a cut is made across the long axis at other than a right angle, it is called an **oblique section**.

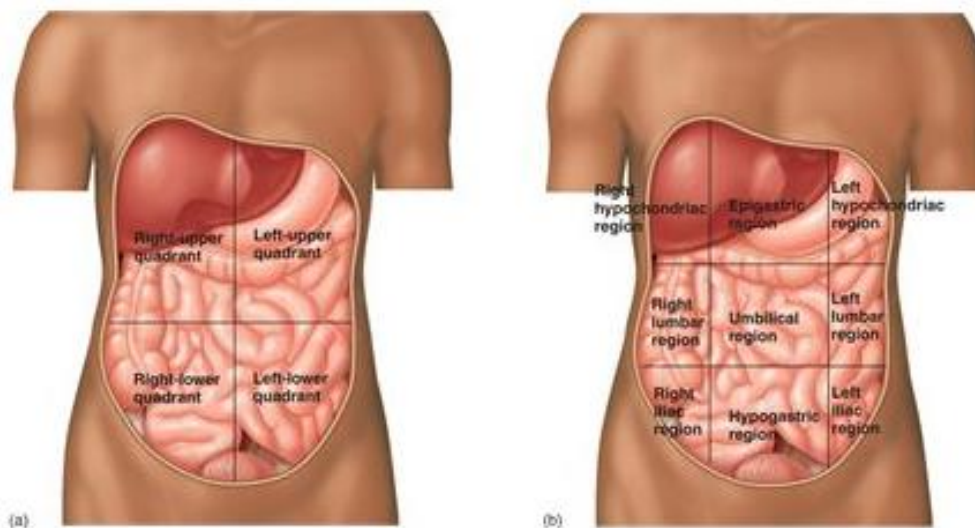
Body Cavities

- **1) Thoracic cavity:** upper cavity; contains the lungs and the **mediastinum** (which consists of the esophagus, trachea, blood vessels, thymus, heart and nerves).
- **2) Abdominal cavity:** the largest cavity; enclosed anteriorly by the abdominal muscles; contains the stomach, intestines, spleen, liver, pancreas, and the kidneys.
- **3) Pelvic cavity:** enclosed by the pelvic bones; contains bladder, parts of the large intestine and reproductive organs.
- Occasionally abdominal cavity and pelvic cavity grouped together as **abdominopelvic cavity**.



Subdivisions of the Abdomen

- **Quadrants:** right-upper quadrant, left-upper quadrant, right-lower quadrant, left-lower quadrant.
- **Regions:** right hypochondriac region, epigastric region, left hypochondriac region, right lumbar region, umbilical region, left lumbar region, right iliac region, hypogastric region, left iliac region.
- We divide the abdomen into quadrants or regions for descriptive or diagnostic purposes.



Body Parts and Regions

Copyright © The McGraw-Hill Companies, Inc. Permission required for reproduction or display.

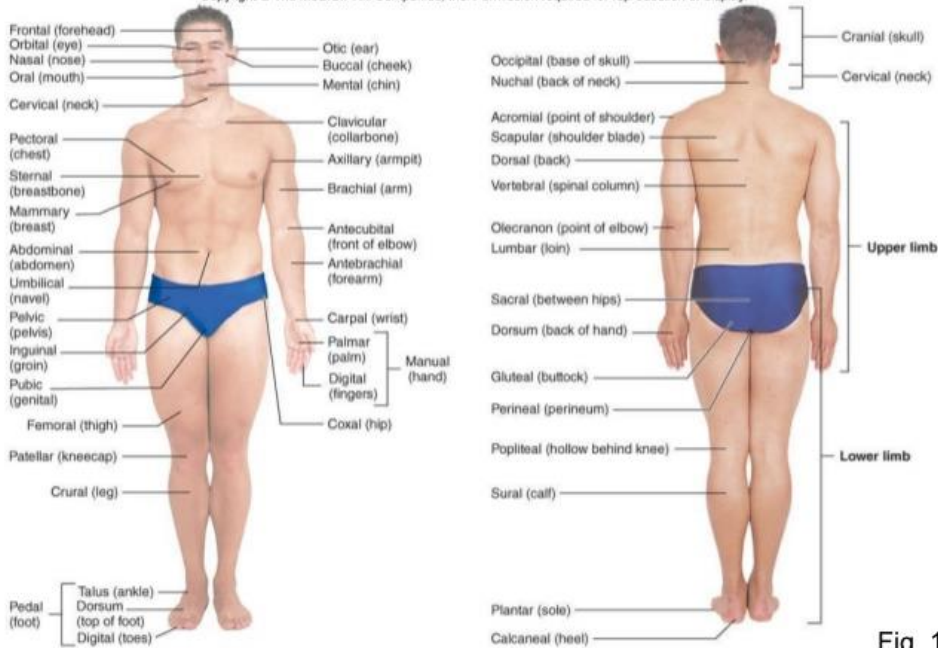


Fig 1 11

C1 L3 – Serous Membranes – iLecture Notes

Serous Membranes

- Also known as serosa.
- Serous membranes line the cavities in the trunk of the body and cover the organ within these cavities.
- 2 layers: **parietal** layer lines the trunk cavity whereas the **visceral** layer lines the organs.
- Are continuous – visceral layer connects directly to parietal layer.
- Serous fluid produced by the membrane fills the cavity between the two layers and acts as a lubricant between the organ and the body wall.
- Three different serous membranes in the trunk of the body:
 - Heart = **pericardium**
 - Lungs and thoracic cavity = **pleura**
 - Abdominopelvic cavity = **peritoneum**.
 - Retro-peritoneum = behind the peritoneum.
- We need serous membranes lining body cavities as they are a point of attachment to the body (hold organs to the body wall) and the serous fluid acts as a lubricant between the organ and the body wall which is important to prevent friction for organs that move.

