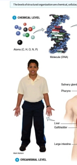
Anatomy
Is the science of body structures and the relationships among them.

- Pathological anatomy
- Imaging anatomy
- Surface anatomy
- Gross anatomy
- Systemic anatomy
- Regional anatomy

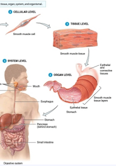
Physiology
Is the science of body functions—how the body parts work.

- Pathophysiology
- Exercise physiology
- Renal physiology
- Immunology
- Molecular physiology
- Neurophysiology
- Endocrinology
- Cardiovascular physiology
- Respiratory physiology

Levels of structural orga


The levels of structural organization are chemical, cellular,
1 CHEMICAL LEVEL
Atoms (C, H, O, N, P)
Molecule (DNA)
Salivary gland
Pharynx
Liver
Gallbladder
Large intestine
Mark Nielsen
6 ORGANISMAL LEVEL

nization in the human body.


tissue, organ, system, and organismal.
2 CELLULAR LEVEL
Smooth muscle cell
3 TISSUE LEVEL
Smooth muscle tissue
5 SYSTEM LEVEL
4 ORGAN LEVEL
Epithelial and connective tissues
Mouth
Esophagus
Smooth muscle tissue layers
Epithelial tissue
Stomach
Stomach
Pancreas (behind stomach)
Small intestine
Digestive system

1. **Chemical level**
    - a. **atoms-** smallest unit of matter that participates in a chemical reaction Carbon, Hydrogen, Nitrogen, Phosphorous, Calcium, Sulfur
    - b. molecules- two or more atoms joined together DNA, glucose, phospholipids
2. **Cellular level**
    - Molecules combine to form cells are the basic units of life

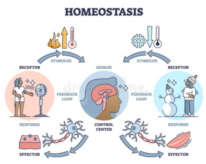
      Smooth muscle cells, epithelial cells
3. **Tissue level**
    - Groups of similar cells that work together to perform a particular function
    - 4 basic types of tissue: epithelial, connective, muscular, nervous
4. **Organ level**
    - structures composed of two or more different types of tissues with specific functions and recognizable shapes

      stomach, intestines, heart, liver, lung, brain
5. **System level**
    - Related organs that have a common function digestive, respiratory, integumentary, skeletal, etc...
6. **Organismal level**
    - All parts of the human body functioning together constitute the total organism

The 11 Systems of the Human Body

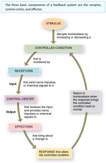
1. **Integumentary system**
    - skin, hair, nails, sweat and oil glands
      Functions: protection, regulation, temperature
2. **Muscular system**
    - skeletal muscle (attached to bone)
      Functions: produces body movements
3. **Skeletal system**
    - bones, joints, cartilage
      Function: support, protection, aids movement
4. **Nervous system**
    - brain, spinal cord, nerves, sense organs
      Function: generates nerve impulses to regulate body activities
5. **Endocrine system**
    - hormone producing glands
      Function: regulates body activities
6. **Lymphatic and Immune system**
    - lymphatic fluid and vessels, spleen, thymus, lymph nodes, tonsils.
      Function: return proteins and fluid to blood, immune response
7. **Cardiovascular system**
    - blood heart blood vessels
      Function: carries oxygen and nutrients to cells and carries CO_2 and wastes away
8. **Respiratory system**
    - lungs, pharynx, larynx, trachea, bronchial tubes
      Function: transfers oxygen from air to blood and CO_2 from blood to air
9. **Digestive system**
    - gastrointestinal tract mouth, pharynx, esophagus, stomach, small and large intestines, salivary glands, liver, gallbladder, pancreas
      Function: breakdown food
10. **Urinary system**
    - kidneys, ureters, urinary bladder, and urethra
      Function: Produces, stores and eliminates urine, homeostasis of body fluids, regulates RBC production
11. **Reproductive system**
    - testes, ovaries, penis, vagina, uterus
      Function: produce gametes to form new organisms

INTRODUCTION TO HUMAN BODY


HOMEOSTASIS
STIMULUS
STIMULUS
RECEPTOR
SENSOR
RECEPTOR
FEEDBACK LOOP
FEEDBACK LOOP
CONTROL CENTER
RESPONSE
RESPONSE
EFFECTOR
EFFECTOR

Homeostasis

Is a dynamic condition which maintain relatively stable conditions in the body's internal environment. It occurs because of the ceaseless interplay of the body's many regulatory systems.



The three basic components of a feedback system are the receptor, control center, and effector.

STIMULUS
disrupts homeostasis by increasing or decreasing a
CONTROLLED CONDITION
that is monitored by
RECEPTORS
Input
that send nerve impulses or chemical signals to a
CONTROL CENTER
Output
that receives the input and provides nerve impulses or chemical signals to
EFFECTORS
that bring about a change or
RESPONSE that alters the controlled condition
Return to homeostasis when the response brings the controlled condition back to normal

Feedback system

Negative feedback system

reverses a change in a controlled condition.

Positive feedback system

tends to *strengthen* or *reinforce* a change in one of the body's controlled conditions.

Basic Life Processes

There are 6 basic life processes that distinguish living things fro

1. **Metabolism**- the sum
2. **Responsiveness**- the b
3. **Movement**- motion of
4. **Growth**
   - increase in
     in growing
5. **Differentiation**- unspe
6. **Reproduction**
   - refers to

m non-living

of all chemical processes that occur in the body.

- a. **catabolism-** breaking down of chemical substances(digestion)
- b. **anabolism-** building up of chemical substances from smaller or simpler ones(make proteins)

ody's ability to detect and respond to changes in its internal and external environment.

- a. **Internal-** decrease in body temperature
- b. **External-** turning your head toward sound

the whole body, individual organs, single cells and organelles.

- a. **whole body** coordination of leg muscles for running or walking
- b. **individual organs** after a meal gallbladder releases bile into GI tract
- c. **single cells** damage or infection activates immune responses WBCs begin repair processes

body size in the size of existing cells, the number of cells or the amount of material surrounding the cells
bone, mineral deposits accumulate between bone cells, causing the bone to grow in length and width

ecialized cells become specialized cells

- a. **each type of body cells** (heart, liver, skin) is specialized for a particular function.
- b. **all specialized cells** had to originate from an unspecialized ancestor cells
- c. **stem cell- unspecialized cell** that give rise to cells that undergo cell differentiation

either formation of new cells for tissue growth and repair or the production of a new individual organism

Basic Anatomical Terminology

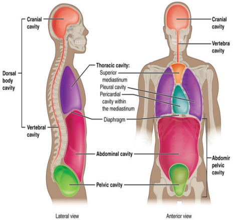
Body Position

- a. **Supine-** a body lying faceup
- b. **Prone-** body lying facedown

Regional names are terms given to specific regions of the body.

The principal regions are the head, neck, trunk, upper limbs, and lower limbs.

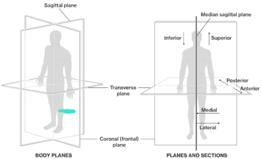
Examples are thoracic (chest), nasal (nose), and carpal (wrist).


Cranial cavity
Dorsal body cavity
Vertebral cavity
Thoracic cavity:
Superior mediastinum
Pleural cavity
Pericardial cavity within the mediastinum
Diaphragm
Abdominal cavity
Pelvic cavity
Cranial cavity
Vertebra cavity
Abdomir pelvic cavity
Lateral view
Anterior view

Planes are imaginary flat surfaces that are

Body cavities are spaces in the body that h

Anatomical Planes and Sections


Sagittal plane
Median sagittal plane
Inferior
Superior
Transverse plane
Posterior
Anterior
Medial
Lateral
Coronal (frontal) plane
BODY PLANES
PLANES AND SECTIONS

Trial Version

Medical
techniques and procedures used to

used to divide the body or organs to visualize interior structures.

1. **sagittal plane** is a vertical plane that divides the Small intestine Descending colon INFERIOR body or an organ into right and left sides.
    - **midsagittal plane** divides the body or an organ into equal right and left sides.
    - **parasagittal plane** divides the body or an organ into unequal right and left sides.
2. **frontal plane** divides the body or an organ into anterior and posterior portions.
3. **transverse plane** divides the body or an organ into superior and inferior portions.
4. **oblique plane** passes through the body or an organ at an oblique angle.

help protect, separate, and support internal organs.

1. **Cranial cavity** Formed by cranial bones and contains brain.
2. **Vertebral canal** Formed by vertebral column and contains spinal cord and the beginnings of spinal nerves.
3. **Thoracic cavity** Chest cavity; contains pleural and pericardial cavities and the mediastinum.
    - *Pleural cavity* A potential space between the layers of the pleura that surrounds a lung.
    - *Pericardial cavity* A potential space between the layers of the pericardium that surrounds the heart.
    - *Mediastinum* Central portion of thoracic cavity between the lungs; extends from sternum to vertebral column and from first rib to diaphragm; contains heart, thymus, esophagus, trachea, and several large blood vessels.
4. **Abdominopelvic cavity**
    - *Abdominal cavity* Contains stomach, spleen, liver, gallbladder, small intestine, and most of large intestine; the serous membrane of the abdominal cavity is the peritoneum.
    - *Pelvic cavity* Contains urinary bladder, portions of large intestine, and internal organs of reproduction.

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Imaging
create images of the human body.

- **Radiography** uses electromagnetic radiation to take images of the inside of the body. The most well-known and common form of radiography is x-ray.

  The resulting 2D image is a *radiograph*

- **Magnetic Resonance Imaging (MRI)** involves radio waves and magnetic fields to look at the organs and other structures in the body.

  The result is a 2D or 3D blueprint of cellular chemistry.

- **Computed Tomography (CT)** formerly called computerized axial tomography (CAT) scanning an x-ray beam traces an arc at multiple angles around a section of the body.

  The resulting *transverse section* of the body, called a CT scan

- **Ultrasound Scanning** uses an ultrasound machine with a silent high-frequency sound waves to produce live images of the internal structures of the body also known as *sonogram*.

  The image, which may be *still* or *moving*, is called a *sonogram*

- **Coronary (CARDIAC) Computed Tomography Angiography (CCTA) Scan** an iodine containing contrast medium is injected into a vein and a beta blocker is given to decrease heart rate. Then, numerous x-ray beams trace an arc around the heart and a scanner detects the x-ray beams and transmits them to a computer, which transforms the information into a 3D image of the coronary blood vessels on a monitor.

  The image produced is called a *CCTA scan* and can be generated in less than 20 seconds.

- **Positron emission tomography (PET)** is a 3D functional imaging technique, In contrast to CT and X-ray, it demonstrate the physiological activities of tissues and organs of the body using a radiotracer. The injected radiotracer concentrates within a tissue which is been displayed on a computer as a 3D image.

  The machine is similar to CT and MRI, and modern PET scan images can be combined with CT or MRI scans to create unique view

- **Endoscopy** involves the visual examination of the inside of body organs or cavities using a lighted instrument with lenses called an *endoscope*.

  The image is viewed through an eyepiece on the *endoscope*.

- **Radionuclide Scanning** a radioactive substance is introduced intravenously into the body and carried by the blood to the tissue to be imaged. Gamma rays emitted by the radionuclide are detected by a gamma camera outside the subject, and the data are fed into a computer.

  The computer constructs a *radionuclide image* and displays it in color on a video monitor.