Human Anatomy and Body Systems
Levels of Organization

The human body is organized in several levels, from the simplest to the most complex. . .

**Cells** – the basic unit of life

**Tissues** – clusters of cells performing a similar function

**Organs** – made of tissues that perform one specific function

**Organ Systems** – groups of organs that perform a specific purpose in the human body

The purpose of the 11 organ systems is for the human body to maintain **homeostasis**.
**Human homeostasis** is derived from the Greek, homeo or "same", and stasis or "stable" and means remaining stable or remaining the same.

**Homeostasis** - “Maintaining a balanced internal environment.”

In humans, homeostasis happens when the **body** regulates body **temperature** in an effort to maintain an **internal temperature** around 98.6 degrees Fahrenheit. For example, we **sweat** to cool off during the hot summer days, and we **shiver** to produce **heat** during the cold winter **season**.
The 11 Human Body Systems

The 11 human body systems are:

1. digestive system
2. excretory system
3. respiratory system
4. circulatory system
5. nervous system
6. skeletal system
7. muscular system
8. lymphatic (immune) system
9. integumentary system
10-11. endocrine system (includes reproductive system)
The Digestive System

Purpose: to convert food particles into simpler micromolecules that can be absorbed into the bloodstream and used by the body.

Major Organs and their Functions:

Mouth – to chew and grind up food

-- saliva also begins the chemical breakdown

Esophagus – pipe connecting mouth to stomach

Stomach – secretes an extraordinarily strong acid (pH = 2) that leads to breakdown of food

-- once the food is broken down in the stomach and mixed with digestive juices, it is called **chyme**.
Pancreas – produces the hormone **insulin** that regulates blood sugar levels

-- also help neutralize stomach acid

Liver – produces bile, which breaks down fats in foods

Gallbladder – pouch-like organ that stores **bile** for future use

Small Intestine – after digestion is complete, the chyme enters the small intestine where it is absorbed into the bloodstream

-- the chyme is propelled along by folded surfaces called **villi**, on the intestine

Large Intestine – removes water from the chyme and gets the waste ready for excretion
The Digestive System

- mouth and salivary glands
- esophagus
- liver
- gallbladder
- duodenum
- ascending colon
- ileum
- cecum
- appendix
- stomach
- pancreas
- transverse colon
- descending colon
- jejunum
- sigmoid colon
- rectum
- anus

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The Excretory System

**Purpose:** to rid the body of wastes, including excess water and salts

**Major Organs and Their Functions**

**Kidneys** – the main organs of the excretory system

-- waste-laden blood enters the kidney and the kidney **filters** out urea, excess water and other waste products, which eventually travel out of the kidney as **urine**

-- eventually they travel through the **ureter** to the urinary **bladder**

**Rectum** – solid (food) waste travels out of the body through the rectum
**Skin** – sweat glands remove excess water and salts from the body

**Lungs** – expel the waste gas carbon dioxide
The Respiratory System

**Purpose:** to provide the body with a fresh supply of oxygen for cellular respiration and remove the waste product carbon dioxide

**Major Organs and Their Functions**

**Nose** – internal entry and exit point for air

**Pharynx** – serves as a passage way for both air and food at the back of the throat

**Larynx** – your “voicebox”, as air passes over your vocal chords, you speak

**Trachea** – the “windpipe”, or what connects your pharynx to your lungs

--- a piece of skin, called the **epiglottis**, covers the trachea when you swallow, preventing food from entering
Lungs -

**Bronchi** - the two large passageways that lead from the trachea to your lungs (one for each lung)

-- the bronchi are further subdivided into bronchioles
-- eventually, the further subdivisions lead to tiny air sacs called **alveoli**
  -- alveoli are in clusters, like grapes
  -- capillaries surrounding each alveolus is where the exchange of gases with the blood occurs

The **diaphragm** is the muscle that causes you to breath
-- hiccups are involuntary contractions of the diaphragm
Image of the Respiratory System

Nasal passages
Mouth
Epiglottis
Trachea
Pharynx (Throat)
Larynx
Right upper lobe
Right bronchus
Right middle lobe
Right lower lobe
Pulmonary vein
Left bronchus
Left upper lobe
Pulmonary arteries
Bronchioles
Pleura
Alveoli
Left lower lobe

RIGHT LUNG
LEFT LUNG

oxygen-rich blood
oxygen-poor blood
The Circulatory System

**Purpose:** to deliver oxygenated blood to the various cells and organ systems in your body so they can undergo cellular respiration

**Major Organs and Their Functions**

**Heart** – the major muscle of the circulatory system

-- pumps blood through its four chambers (two ventricles and two atria)

-- pumps deoxygenated blood into the lungs, where it gets oxygenated, returned to the heart, and then pumped out through the aorta to the rest of the body

-- valve regulate the flow of blood between the chambers
**Arteries** – carry blood away from the heart and to the major organs of the body

**Veins** – carry blood back to the heart away from the major organs of the body

**Capillaries** – small blood vessels where gas exchange occurs

**Blood** – the cells that flow through the circulatory system
  -- red blood cells contain **hemoglobin**, an iron-rich protein that carries oxygen
  -- white blood cells function in the immune system
  -- platelets help in blood clotting

**Spleen** – helps to filter out toxins in the blood
The Circulatory System

- anterior vena cava
- posterior vena cava
- lung
- heart
- stomach
- aorta
- spleen
- intestine
- liver
- portal vein
- kidney
- capillary bed
The Nervous System

**Purpose**: to coordinate the body’s response to changes in its internal and external environment

**Major Organs and Their Functions**

**Brain** – control center of the body, where all processes are relayed through

-- consists of cerebrum (controls though and senses) and cerebellum (controls motor functions)

**Spinal Cord** – sends instructions from the brain to the rest of the body and vice versa

-- any organism with a major nerve cord is classified as a **chordate**

**Nerves** – conduct impulses to muscle cells throughout the body
The Nervous System
Diagram of a Nerve Cell

dendrites

cell body

axon

nodes of Ranvier

myelin sheath

synapses
The Endocrine System

**Purpose:** The endocrine system influences almost every cell, organ, and function of our bodies. The endocrine system is instrumental in regulating mood (secretion of hormones), growth and development, tissue function, metabolism, and sexual function and reproductive processes.

**Major Organs**

-- hypothalamus
-- pituitary gland
-- thyroid
-- parathyroid
-- adrenal glands
-- pancreas
-- testes
-- ovaries
The Skeletal System

**Purpose:** to provide structure and support to the human body

Bones are where new blood cells are generated (in the marrow), and require the mineral **calcium** for strength

**Major Bones of the Human Body**

-- femur (thigh bone)  
-- radius and ulna (lower arm)  
-- sternum (breastbone)  
-- fibula and tibia (calf)  
-- scalpula (shoulder)  
-- coccyx (tail bone)  

-- humerus (upper arm)  
-- cranium (skull)  
-- clavicle (shoulder blade)  
-- vertebrae (back)  
-- pelvic bone  
-- phalanges (fingers/toes)
The Muscular System

**Purpose:** works with the skeletal and nervous system to produce movement, also helps to circulate blood through the human body.

--- muscle cells are fibrous

--- muscle contractions can be voluntary or involuntary

**Major Muscles in the Human Body**

-- biceps  -- triceps  -- deltoids

-- glutes  -- hamstrings
The human body has three types of muscles: cardiac, skeletal, and smooth.

Each type has a different role that it plays in the body.
The Lymphatic (Immune) System

**Purpose:** - to remove infectious diseases and other pathogens from the human body.

**Major Organs and Their Functions:**

**Skin (hair, nails)** – also called the INTEGUMENTARY SYSTEM, the skin is the body’s first line of defense.

1. Prevent water loss
2. Protect body from injury and infection
3. Helps regulate body temperature
4. Eliminates waste in the form of sweat or perspiration
5. Receives information from the environment (heat, pain, and pressure)
6. Uses sunlight to produce vitamin D

**White Blood Cells** – recognize disease agents (antigens) and create antibodies to tag and remove these antigens

-- phagocytes are the white blood cell type that actually eats and destroys these antigens

**Lymph Nodes** – help restore fluid lost by the blood and return it to the circulatory system