Human Body Systems
Regulation and Homeostasis in the Human Body: Quick view
Eleven Body Systems work together to maintain homeostasis.

<table>
<thead>
<tr>
<th>1. Nervous System</th>
<th>2. Endocrine System</th>
</tr>
</thead>
<tbody>
<tr>
<td>3. Lymphatic System</td>
<td>4. Circulatory System</td>
</tr>
<tr>
<td>5. Respiratory System</td>
<td>6. Digestive System</td>
</tr>
<tr>
<td>7. Excretory System</td>
<td>8. Skeletal System</td>
</tr>
<tr>
<td>9. Muscular System</td>
<td>10. Integumentary System</td>
</tr>
<tr>
<td>11. Reproductive System</td>
<td></td>
</tr>
</tbody>
</table>
Human Body Organization

The Human Body
is composed of

Organ Systems
are composed of

Organs
are composed of

Tissues
are composed of

Cells
What is the job of your circulatory system?

• To transport oxygen and nutrients around your body and to help to get rid of wastes
What organs, or parts, make up your circulatory system?

- Arteries
- Veins
- Heart
- Blood
The heart pumps blood through the body.
Types Of Blood Vessels

Arteries

- Move blood away from heart
- Have thick & elastic walls, made of smooth muscles.
- Are connected to ventricles in the heart.
Types Of Blood Vessels

Veins

- Move blood **toward** the heart
- Have **one-way** valves.
- Are squeezed by **skeletal** muscles.
- Carry blood with **waste materials** and that is oxygen-**poor**.
Types Of Blood Vessels

Capillaries

- Are **microscopic** blood vessels.
- Connect **arteries** to **veins**.
- Their walls are **only one cell** thick!
- **Nutrients** and **oxygen** are exchanged from the blood to body cells through capillary walls.
ARteries - from heart

Veins - to heart

Capillaries
Blood

Red Blood Cell
White blood cell

Red blood cell
# Parts of Human Blood

<table>
<thead>
<tr>
<th>White blood cells</th>
<th>Red blood cells</th>
<th>Platelets</th>
<th>Plasma</th>
</tr>
</thead>
<tbody>
<tr>
<td>Help fight infection</td>
<td>Transport O₂</td>
<td>Help clot blood</td>
<td>Contains nutrients &amp; minerals The liquid part of blood</td>
</tr>
</tbody>
</table>
Digestive System

Function:
Digestion is the process of breaking **food** into small molecules so that they can be absorbed and **used** by the body.
Nutrients...

- Are substances in food that provide **energy** and materials for cell development, **growth**, and **repair**.
The Digestive System

Function: to change food into simpler molecules that can be absorbed into bloodstream and used by the body

Major Organs: Organs that food will pass through

Mouth

Esophagus

Stomach

Small intestine

Large intestine
The Digestive System

**Purpose:** to change food into simpler molecules that can be absorbed into bloodstream and used by the body

**Major Organs:** Organs that food will pass through

- Mouth
- Esophagus
- Stomach
- Small intestine
- Large intestine
Your Digestive System

**Esophagus:** muscular tube that connects throat to stomach. Moves food down by squeezing *(peristalsis)*
Your Digestive System

Stomach: muscular **bag** where chemical and mechanical digestion continue; food stays here ~4 **hours**, changes to **chyme**
Small Intestine:

- Tube nearly **7 meters** long where digestive juices from **liver and pancreas** are added
- **villi** absorb small nutrient molecules.
- **All chemical and physical digestion ENDS**

![Diagram of the small intestine with labels for Duodenum, Jejunum, Ileum, and villi](image)
The small intestine absorbs nutrients and transfers the nutrients to the circulatory system. The small intestine is lined with small fingerlike projections known as **villi** which designed to have a large surface area for this task.

**Small Intestine**

**Villus**
Large Intestine: absorbs water from undigested food, where unabsorbed materials become more solid.
**Rectum**: where solid wastes (feces) are stored.

**Anus**: muscles control the release of solid wastes from the body.
Respiratory System

Major Structures
- lungs, nose, mouth, trachea

Functions
- moves air into and out of lungs; controls gas exchange between blood and lungs
The **Respiratory System** links to the **Circulatory System** to provide cells with oxygen and remove carbon dioxide.

Bronchi branch to air sacs known as **aveoli** where gas exchange occurs.
Gas Exchange in the lungs occurs through the process of **DIFFUSION**

High concentration of oxygen ($O_2$) moves out of lungs into blood to balance concentration. $CO_2$ does the opposite (moves from blood to lungs).
The Lungs are only air sacs. In order for them to move they must work together with a muscle known as the Diaphragm.
Excretory System

Functions
• Removes cellular wastes from blood and the body

Major Structures
• kidneys
• urinary bladder
• ureters
• urethra
• skin,
• lungs
Wastes and water diffuse out of the blood into filters in the kidney. The kidneys form the liquid waste URINE. Urine leaves the kidneys and is passed from the ureters to the urinary bladder.
How does the human body move from place to place and have the ability to run, blink or build things?

*These things are all made possible by the skeletal and muscular systems.*
Muscular System

Function: MOVEMENT

Major Muscle Types

- **Skeletal** – Attached to bones for voluntary actions

- **Smooth** – Found in the digestive tract and the blood vessels to move food and blood. Control involuntary actions (you do not decide for them to work)

- **Cardiac** – Heart muscle cells are involuntary.
Skeletal muscles work in opposing pairs. When one muscle contracts, the other relaxes.

https://www.youtube.com/watch?v=VCminz-X52I
Interesting Facts…

- There are nearly 600 skeletal muscles that make up nearly half of the total body weight in the human.
- Muscles can only pull – they cannot push.
- Energy is stored in the muscles in a chemical called ATP.
- Lactic acid is released when the muscles are overworked and lack O$_2$, making the muscles hurt or ache.
- **Muscles are attached to bones by tendons.**
- The biggest muscles in the body are the gluteus maximus muscles (buttocks), but the muscle that can exert the most force is the masseter (jaw muscle).
Skeletal System

Major Structures
- bones and joints

Functions
- protects organs
- shapes & supports the body
- interacts with skeletal muscles allows for movement
- produces blood cells in the bone marrow
- stores minerals calcium and phosphorous
Interesting Facts…

- A baby is born with 270 bones while an adult body has 206 bones.
- The hands and feet contain half of the bones in the human body.
- Bones are made of the hard mineral calcium, living cells, blood vessels and nerves.
- Bones are made of several layers – periosteum, compact bone, and spongy bone.
- A joint is where two bones meet.
- Joints can be fixed (the skull), ball-and-socket (shoulders and hips), pivot (neck), gliding (wrists), and hinged (fingers, elbows, and knees).
Reproductive System

Functions

• produces gametes
• Eggs (female)
• Sperm (male)
• Allows for the continuation of the species.

Major Structures

• ovaries, uterus, and (in females)
• testes and penis (in males)
The Reproductive System
Functions to make new individuals by producing, storing and releasing specialized sex cells known as gametes.

Cells from the male reproductive system, known as sperm, must fuse with cells of the female reproductive system, known as eggs.
Interesting Facts…

• A person grows over 5 million times bigger changing from a single cell to a newborn human being.
• Humans grow for about 20 years, changing from a child to an adult.
• **Male reproductive cells are called sperm, and female reproductive cells are called eggs.**
• **Sperm and eggs have only 23 chromosomes each.**
• When joined together, sperm and egg make a whole cell called a zygote which can grow into a baby.
Nervous System

Major Structures

- brain, spinal cord, nerves, sense organs

Functions

- regulates behavior;
- maintains homeostasis;
- regulates other organ systems;
- controls sensory and motor functions
The Nervous System:
The nervous system is the number one communication center of the body. The basic cell type that carries the communications are neurons that transmit electrical impulses.
The nervous system is divided into two divisions:

• The **Central Nervous System (CNS)**—Responsible for relaying messages, processing and analyzing information.

• The **Peripheral Nervous System** – Receives information from the environment and relays commands from the CNS to the organs and glands.
Cerebrum

Cerebellum

Medulla oblongata

BRAIN STEM
The brain is the main switching area of the central nervous system.

**Cerebrum** – Responsible for voluntary activities of the body (Intelligence, learning and judgement)

**Cerebellum** – Coordinates muscle movement and balance

**Brain Stem** – Consists of the **pons** and the **medulla oblongata**. Pass message between brain and body
Interesting Facts…

• The left half of the brain controls the right half of the body and vice-versa.

• The human brain is more powerful and complicated than the world’s biggest computer. It can store millions of memories and do billions of calculations every day.

• The human body has over 100 billion neurons in all.

• The brain can receive over 100,000 signals per second.

• Messages whiz through the nerves at up to 270 mph.

• Neurons reaching from the spinal cord to the toes are the longest cells in the human body, measuring up to 4 feet in length.
Endocrine System

Functions:
- regulates body activities
- temperature, metabolism
- development, and reproduction
- maintains homeostasis
- regulates other organ systems

Major Glands (organs):
- hypothalamus
- pituitary
- Pancreas
- Adrenal
- Thyroid
- testes and ovaries

*Produces hormones, chemicals that control the body.*
Hypothalamus
Pituitary
Parathyroids
Thymus
Adrenal Glands
Pineal Gland
Thyroid
Pancreas
Ovary (female)
Testis (male)
Endocrine Glands
Endocrine System

• Endocrine glands release hormones, chemicals that act as signals telling different parts of the body what to do.
• The body makes over 20 hormones, each with a different job to do.
• The blood carries hormones around the body until reaching the target organ, the body part needing it.
• Hormones can affect the way a person feels.
• As a person ages, the body makes less of some hormones.
# Important Glands and Hormones of the Human Body

<table>
<thead>
<tr>
<th>Gland</th>
<th>Hormone</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pineal</td>
<td>Melatonin</td>
<td>Controls sleep and wake cycle</td>
</tr>
<tr>
<td>Thyroid</td>
<td>Thyroxine</td>
<td>Controls appetite and metabolism</td>
</tr>
<tr>
<td>Adrenal</td>
<td>Adrenaline</td>
<td>Deals with stressful situations</td>
</tr>
<tr>
<td>Thymus</td>
<td>Thymosin</td>
<td>T-cell development (fight diseases)</td>
</tr>
<tr>
<td>Ovary</td>
<td>Estrogen</td>
<td>Female reproduction</td>
</tr>
<tr>
<td>Testis</td>
<td>Testosterone</td>
<td>Male reproduction</td>
</tr>
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</table>