11 Organ Systems of the Human Body (Made Easy!)

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1. Introduction to the 11 Organ Systems

System Category	Systems	Main Functions
Support and Movement	Integumentary, Skeletal, Muscular	Provide structure and enable movement
Integration and Coordination	Nervous, Endocrine	Control other systems

Transport	Cardiovascular, Lymphatic (including Immune)	Move substances throughout the body
Absorption and Excretion	Respiratory, Digestive, Urinary	Bring things in or remove things out
Reproduction	Male Reproductive, Female Reproductive	Produce new offspring

- There are 11 Organ systems in the human body.
- These systems are grouped by their main functions.
- Some systems provide **support and movement**.
- Other systems handle **integration and coordination**, controlling other systems.
- Transport systems move substances around the body.
- Absorption and excretion systems bring things in or take things out.
- The Reproductive system creates new life.

2. Systems for Support and Movement: Integumentary System

- The Integumentary system includes your **skin**.
- Other parts are **hair** and **fingernails**.
- The skin has four main functions.
  - It provides **protection**. It stops things like bacteria, viruses, and UV radiation from harming the body.
  - It helps with **temperature regulation**. This happens through sweating, blood flow changes, and insulation.
  - It allows for **sensation**. Nerve endings and Sensory receptors in the skin detect touch and other feelings.
  - It helps with **Vitamin D synthesis**. Vitamin D is made in the skin using sunlight.

3. Systems for Support and Movement: Skeletal System

Skeletal System Organ	Function
Bones (e.g., skull, ribs, humerus)	Provide structural support, act as levers, protect organs, produce blood cells, store minerals
Joints (Fibrous, Cartilaginous, Synovial)	Allow movement (or no movement) between bones

Ligaments	Connect bone to bone
Cartilage (in joints)	Reduces friction between bones

- The Skeletal system is for support and movement.
- Its main organs are **bones**. Examples include the skull, ribs, and humerus.
- **Joints** are also part of this system. There are three types: fibrous (no movement), cartilaginous (some movement), and synovial (lots of movement).
- **Ligaments** connect bone to bone.
- The Skeletal system has several functions.
  - It provides **structural support**.
  - Bones act as **levers for muscles** to cause movement.
  - It offers **protection** for vital organs like the brain, heart, and lungs.
  - Bones produce **blood cells** in the bone marrow.
  - Bones store **minerals** like calcium and phosphate.

4. Systems for Support and Movement: Muscular System

- The Muscular system's main organs are **skeletal muscles**.
- **Tendons** connect muscle to bone.
- Skeletal muscles move our skeleton.
- Other muscle types like cardiac and smooth muscle are in other systems.
- Functions of the Muscular system include **movement**.
- Muscles also help maintain **posture**.
- Another function is **heat production**.

5. Systems for Integration and Coordination: Nervous System

Nervous System Organ/Structure	Function
Brain	Main control center, processes sensory information, controls thoughts, breathing, heart rate, homeostasis
Spinal Cord	Extends from the brain, part of the central nervous system

Nerves (Cranial and Spinal)	Branch out from the brain and spinal cord, carry impulses
Sensory Receptors	At nerve endings, detect stimuli
Sensory Organs (e.g., eyes, ears)	Detect external stimuli
Central Nervous System (CNS)	Brain and spinal cord
Peripheral Nervous System (PNS)	Nerves throughout the body
Dura Mater, Arachnoid Mater, Pia Mater	Membranes protecting the brain and spinal cord
Cerebrospinal Fluid	Protects the brain and spinal cord, circulates in subarachnoid space and ventricles
Nerve Cells (Neurons)	Transmit electrical signals
Synapses	Allow nerve cells to communicate
Cerebrum (with lobes: frontal, parietal, temporal, occipital, insular)	Largest part of the brain, responsible for folds and neurons
Cerebellum	Coordinates movement
Brain Stem (medulla oblongata, pons, midbrain)	Connects brain to spinal cord
Prefrontal Cortex	Personality, problem solving, self-control
Broca's Area	Spoken and written language
Motor Cortex	Controls voluntary movements
Somatosensory Cortex	Processes information from skin receptors
Thalamus	Gateway to consciousness, filters sensory information
Hypothalamus	Autonomic nervous system control, regulates temperature, blood pressure, thirst, hunger

Limbic System (hippocampus, amygdala, fornix, mammillary bodies)	Involved in memory and emotions
Hippocampus	Memory formation
Amygdala	Stores information about dangers
Corpus Callosum	Connects the two hemispheres of the cerebrum
Pituitary Gland	Hormone regulation, growth, reproduction, metabolism
Pineal Gland	Secretes melatonin, influences sleep-wake cycle

- The Nervous system deals with integration and coordination.
- It controls other body systems.
- Key organs are the **brain**, **spinal cord**, and **nerves**.
- **Sensory receptors** and **sensory organs** like eyes and ears are also included.
- The Nervous system uses **fast communication and control**.
- It processes **sensory information**.
- It **coordinates body functions** like breathing and heart rate.
- The Nervous system is made of nerve cells and fibers.
- It has a central part (**brain** and **spinal cord**) and a peripheral part (**nerves**).
- The spinal cord is protected by membranes called dura mater, arachnoid mater, and pia mater.
- Nerves in the periphery connect to the spinal cord.
- Nerve impulses travel from Sensory receptors to the CNS (afferent fibers) and from the CNS to organs (efferent fibers).
- Nerve cells have a cell body, dendrites (receive stimuli), and an axon (transmits impulses).
- Synapses are connections between nerve cells where signals are transmitted.
- The brain has different parts: **cerebrum**, **cerebellum**, and **brain stem**.
- The cerebrum has folds and is divided into lobes.
- The brain is protected by the skull and membranes (meninges).
- Cerebrospinal fluid cushions the brain.
- Specific brain areas control different functions, like the prefrontal cortex for personality or Broca's area for language.
- The thalamus filters sensory information.
- The hypothalamus controls automatic functions like temperature and hunger.

- The limbic system is important for memory and emotions.
- The cerebellum helps coordinate movements.
- The pituitary and Pineal glands are also in the brain and part of the Endocrine system.

6. Systems for Integration and Coordination: Endocrine System

- The Endocrine system, like the Nervous system, controls other systems.
- It controls them more **slowly** than the Nervous system.
- Its function is **long-term communication and regulation**.
- It uses **Hormones** released into the bloodstream.
- Endocrine organs are not directly connected to each other.
- They use the **Cardiovascular system** to transport Hormones.
- Key organs include:
  - **Hypothalamus** and **pituitary gland** in the brain, which control other endocrine organs.
  - **Pineal gland** in the brain, which releases Melatonin for sleep cycles.
  - **Thyroid gland** in the neck, which regulates Metabolism.
  - **Parathyroid glands** near the thyroid, which regulate calcium levels.
  - **Thymus gland** above the heart, which helps develop the immune system by releasing a hormone.
  - **Adrenal glands** near the kidneys, which regulate stress response.
  - **Pancreas** below the stomach, which regulates blood sugar with Insulin and Glucagon.
  - **Ovaries** (female) and **testes** (male), which produce sex Hormones and are also part of the Reproductive system.

7. Systems for Transport: Cardiovascular System

Cardiovascular System Organ/Structure	Function
Heart	Pumps blood throughout the body
Blood Vessels (arteries, veins, capillaries)	Carry blood throughout the body
Blood (including red blood cells, white blood cells, platelets)	Transports oxygen, carbon dioxide, nutrients, hormones, and waste
Arteries	Carry blood away from the heart

Veins	Carry blood back to the heart
Capillaries	Site of exchange between blood and tissues
Heart Chambers (right/left atrium, right/left ventricle)	Receive and pump blood
Valves (e.g., tricuspid, bicuspid, pulmonary semilunar, aortic semi-lunar)	Control blood flow direction through the heart
Pulmonary Artery	Carries low-oxygen blood from the right ventricle to the lungs
Pulmonary Veins	Carry high-oxygen blood from the lungs to the left atrium
Aorta	Carries high-oxygen blood from the left ventricle to the rest of the body
Coronary Arteries	Supply blood to the heart muscle
Coronary Veins	Carry blood away from the heart muscle

- The Cardiovascular system is involved in transport.
- Its main function is transporting **blood** and other substances.
- Blood transports oxygen, carbon dioxide, nutrients, Hormones, and waste.
- Key organs are the **heart**, **blood vessels**, and **blood**.
- The heart acts as a **pump**.
- The heart has four chambers: right atrium, right ventricle, left atrium, and left ventricle.
- The right side pumps blood to the lungs, and the left side pumps blood to the rest of the body.
- Blood vessels spread throughout the body.
- Arteries carry blood away from the heart, and veins carry blood back.
- Capillaries are where oxygen and carbon dioxide are exchanged.
- Blood contains red blood cells (transport oxygen), white blood cells (fight pathogens), and Platelets (help clotting).
- Blood is considered an organ.
- Blood flows through the heart chambers, controlled by valves.
- Blood goes to the lungs via the pulmonary artery and returns via pulmonary veins.

- The aorta carries blood to the body.
- Coronary arteries supply blood to the heart muscle itself.

8. Systems for Transport: Lymphatic and Immune Systems

- The lymphatic and immune systems are often grouped together.
- The Lymphatic system has three main functions.
  - It helps **reduce swelling** by draining excess fluid from tissues.
  - It **scans for pathogens** and starts an immune response.
  - It **absorbs fat** from the digestive tract.
- Lymphatic Capillaries collect excess fluid from tissues.
- This fluid is called **lymph**.
- Lymph travels through **lymphatic vessels** and **lymph nodes**.
- Lymph nodes filter lymph and contain immune cells (B cells and T cells).
- Lymph eventually drains back into the bloodstream near the subclavian veins.
- Fats absorbed from the intestine are packaged into chylomicrons and enter lymphatic Capillaries.
- Primary lymphatic organs produce immune cells.
  - **Bone marrow** produces white blood cells and B cells.
  - **Thymus** matures T cells.
- Secondary lymphatic organs help with the immune response.
  - **Spleen** filters blood for pathogens and breaks down old red blood cells.
  - **Tonsils** contain lymphocytes to fight pathogens in the face and neck cavities.

9. Systems for Absorption and Excretion: Respiratory System

Respiratory System Organ/Structure	**Function**
Lungs	Site of gas exchange
Diaphragm	Muscle for breathing (inspiration)
Nasal Cavity/Oral Cavity	Air enters the body
Pharynx (throat)	Air passes through
Larynx (voice box)	Contains vocal cords

Trachea (windpipe)	Carries air to bronchi
Bronchi (primary, secondary, tertiary)	Branches carrying air into lungs
Bronchioles	Smaller branches in lungs
Alveoli	Tiny air sacs where gas exchange occurs
External Intercostal Muscles	Help with inspiration
Internal Intercostal Muscles	Help with forced expiration
Transversus Thoracis Muscle	Helps with forced expiration
Hilum of the lung	Where bronchi and blood vessels enter/leave the lung

- The Respiratory system handles absorption and excretion.
- Its main function is **gas exchange**.
- It brings **oxygen** into the bloodstream.
- It removes **carbon dioxide** from the body.
- Key organs include the **lungs** and **diaphragm**.
- Air travels through the nasal cavity, pharynx, larynx, and trachea.
- The trachea branches into **bronchi** and then **bronchioles**.
- **Alveoli** are tiny air sacs in the lungs where oxygen and carbon dioxide are exchanged with the blood.
- The **diaphragm** is the main muscle for breathing in (inspiration).
- External intercostal muscles also help with breathing in.
- Breathing out (expiration) is mostly passive.
- Internal intercostal muscles and transversus thoracis help with forceful breathing out.
- The lungs have lobes; the right lung has three, and the left lung has two.

10. Systems for Absorption and Excretion: Digestive System

- The Digestive system is for absorption and excretion.
- It has three main functions.
  - **Digestion** breaks down food.
  - **Absorption** takes nutrients into the bloodstream.
  - **Elimination** removes waste from the body.

- Food enters the **mouth** (oral cavity) for initial breakdown.
- Salivary glands produce saliva to help digestion.
- Food travels down the **esophagus** to the stomach.
- The **stomach** continues breaking down food with acid and churning.
- Food then goes to the **small intestine**.
- Most digestion and **absorption** of nutrients happens in the small intestine.
- The **large intestine** (colon) absorbs water and electrolytes.
- Waste is eliminated through the rectum and anus.
- **Accessory organs** help with digestion but food does not pass through them.
  - The **liver** produces bile to break down fats.
  - The **gallbladder** stores bile.
  - The **Pancreas** produces enzymes to break down food.

11. Systems for Absorption and Excretion: Urinary System

Urinary System Organ/Structure	Function
Kidneys	Remove waste from the blood, filter fluid
Ureters	Tubes carrying urine from kidneys to bladder
Bladder	Stores urine
Urethra	Tube carrying urine from bladder to outside the body

- The Urinary system is involved in absorption and excretion.
- Its main function is **removing waste from the blood**.
- This happens in the **kidneys**.
- The kidneys filter fluid from the blood to produce urine.
- The Urinary system also regulates **water balance** in the blood.
- It regulates **electrolyte balance** (salts).
- It helps regulate the **pH** (acidity) of the blood.
- Urine travels from the kidneys through **ureters** to the **bladder**.
- The bladder stores urine.
- Urine leaves the body through the **urethra**.

12. System for Reproduction: Male Reproductive System

- The Reproductive system creates new offspring.
- The male Reproductive system is one part of this.
- Functions include producing and transporting **gametes** (sex cells).
- In males, the gametes are **sperm cells**.
- The primary reproductive organ is the **testes**.
- The testes produce sperm and testosterone (a hormone).
- Sperm travels through structures like the epididymis and vas deferens.
- Seminal vesicles, prostate, and bulbourethral gland produce fluid (semen) that mixes with sperm.
- Semen travels through the urethra and out of the body through the penis.

13. System for Reproduction: Female Reproductive System

- The female Reproductive system is the other part.
- Functions include producing and transporting **gametes** (sex cells).
- In females, the gametes are **egg cells**.
- Another function is to nurture a developing fetus.
- The primary sex organ is the **ovary**.
- The ovary produces egg cells and Hormones (estrogen and progesterone).
- Egg cells travel through the oviducts (fallopian tubes).
- Fertilization often happens in the oviduct.
- The **uterus** is where a fertilized egg implants and a fetus grows.
- The **vagina** is the canal connecting the uterus to the outside.

14. Thoracic Region: External Structures and Muscles

External Thoracic Structure/Muscle	Function
Skin	Outer protective layer
Hypodermis	Fat layer below skin
Sternum (breastbone)	Bone in the center of the chest
Pectoralis Major	Large chest muscle, moves the arm forward and adducts it

Mammary Gland	Produces milk
Serratus Anterior	Muscle on the side, helps with punching motion and lifting ribs for breathing
External Obliques	Abdominal muscles used for bending and twisting the trunk

- This section looks at the outer parts of the chest.
- Starting from the outside, there is **skin** and a **hypodermis** (fat layer).
- The **sternum** (breastbone) is in the front.
- The **pectoralis major** is a large muscle that moves the arm.
- The **mammary gland** produces milk.
- The **serratus anterior** muscle is on the side and helps with arm movement and breathing.
- The **external obliques** are abdominal muscles used for twisting.

15. Thoracic Region: Ribs and Intercostal Muscles

- The **ribs** form the rib cage.
- There are different types of ribs.
  - **True ribs** connect directly to the sternum via costal cartilage.
  - **False ribs** connect indirectly to the sternum via shared costal cartilage.
  - **Floating ribs** do not connect to the sternum at all.
- **Costal cartilage** connects ribs to the sternum, making the rib cage flexible for breathing.
- **Intercostal muscles** are located between the ribs.
- **External intercostal muscles** help lift the ribs when breathing in.
- **Internal intercostal muscles** help move the ribs down when forcefully breathing out.

16. Thoracic Region: Diaphragm and Breathing

- The **diaphragm** is a very important muscle for breathing.
- When you breathe in (inspire), the diaphragm **contracts and moves down**.
- This makes the chest cavity larger.
- The increased space pulls air into the lungs.
- External intercostal muscles also help with breathing in.
- Breathing out (expiration) is usually passive, meaning muscles relax.

- Forced breathing out uses internal intercostal muscles and the transversus thoracis.

17. Thoracic Region: Deeper Muscles and Layers

- Deeper muscles in the chest include the **subclavius** and **pectoralis minor**.
- The subclavius muscle stabilizes the clavicle (collarbone).
- The pectoralis minor muscle is under the pectoralis major and moves the scapula (shoulder blade).
- The body has layers.
- From the outside in, the layers are generally **skin**, **fat layer** (hypodermis), **muscles**, and then **bones**.
- Internal organs are located deeper.

18. Thoracic Region: Internal Organs (Heart and Lungs)

- Inside the chest cavity, you can see the **lungs** and the **heart**.
- There is a **right lung** and a **left lung**.
- The **heart** is located mostly in the middle of the chest, but the tip points to the left.
- The lungs sit on top of the diaphragm.
- Other organs like the liver and stomach are located below the diaphragm in the abdomen.

19. Thoracic Region: Mediastinum Structures (Nerves, Arteries, Veins, Lymphatics)

Mediastinum Structure	Type	Function
Intercostal Nerves	Nerve	Carry signals in the chest region
Rami Communicantes	Nerve branch	Connect intercostal nerves to sympathetic ganglia
Sympathetic Trunk	Nerve structure	Part of the autonomic nervous system
Sympathetic Ganglia	Nerve structure	Clusters of nerve cell bodies

Greater Splanchnic Nerve	Nerve	Controls abdominal organs
Intercostal Arteries	Artery	Supply blood to intercostal muscles and rib cage
Intercostal Veins	Vein	Carry blood from intercostal muscles
Azygous Vein	Vein	Collects blood from right intercostal veins, leads to superior vena cava
Hemiazygos Vein	Vein	Collects blood from left intercostal veins, leads to azygous vein
Accessory Azygous Vein	Vein	Collects blood from left intercostal veins, leads to azygous vein
Thoracic Duct	Lymphatic vessel	Drains lymph from lower body and left arm, empties into subclavian vein

- This section looks at structures in the middle part of the chest (mediastinum).
- **Nerves** like the intercostal nerves and sympathetic trunk are found here.
- The greater splanchnic nerve controls organs in the abdomen.
- **Arteries** like the intercostal arteries branch off the aorta.
- **Veins** like the intercostal veins carry blood to the azygous vein.
- The azygous vein leads to the superior vena cava, which goes to the heart.
- The **thoracic duct** is a lymphatic vessel that drains lymph into the bloodstream.
- It drains lymph from the lower body and the left arm.

20. Practice and Review Resources

- It is important to practice learning anatomy information.
- Practice helps store information in your long-term memory.
- Study guides with practice questions and exercises can help.
- Resources with blank and labeled diagrams can be used for practice.
- Other resources and programs exist to help with learning anatomy.