

Organization of Human Body and Introduction to Physiology

Dr Shahneela Siraj

Associate Professor

DIKIOHS, DUHS.

Learning Objectives

By the end of the Lecture , the student should be able to :

- Define Physiology**
- Appreciate the different levels of organization in the human body.**
- Understand the different body systems of a human body and their major components.**
- Explain extracellular fluid and the internal environment**

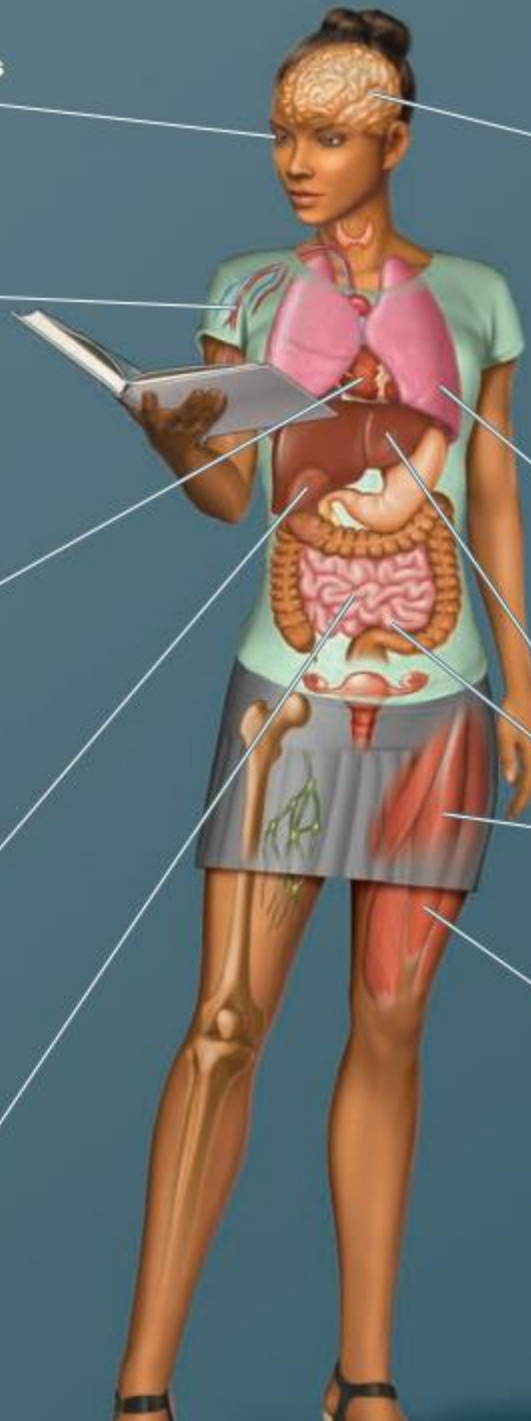
Your eyes will convert the image from this page into electrical signals (nerve impulses) that will transmit the information to your brain for processing.

Approximately 150 million old red blood cells will die and be replaced by newly produced ones.

Your heart will beat 70 times, pumping 5 liters (about 5 quarts) of blood to your lungs and another 5 liters to the rest of your body.

More than 1 liter of blood will flow through your kidneys, which will act on the blood to conserve the "wanted" materials and eliminate the "unwanted" materials in the urine. Your kidneys will produce 1 mL (about a thimbleful) of urine.

Your digestive system will be processing your last meal for transfer into your bloodstream for delivery to your cells.



Besides receiving and processing information such as visual input, your brain will provide output to your muscles to help maintain your posture, move your eyes across the page as you read, and turn the page as needed. Chemical messengers will carry signals between your nerves and muscles to trigger appropriate muscle contraction.

You will breathe in and out about 12 times, exchanging 6 liters of air between the atmosphere and your lungs.

Your cells will consume 250 mL (about a cup) of oxygen and produce 200 mL of carbon dioxide.

You will use about 2 calories of energy derived from food to support your body's "cost of living," and your contracting muscles will burn additional calories.

A Venn diagram with three overlapping circles. The top circle is labeled 'Physiology' and contains the text 'Normal functions of living organism'. The bottom-left circle is labeled 'Anatomy' and contains the text 'Normal Structure of living organism'. The bottom-right circle is labeled 'Biochemistry' and contains the text 'Chemicals in living organism'. The circles overlap in various combinations, but no text is present in the intersection areas.

Physiology

Normal functions of living
organism

Anatomy

Normal Structure of living
organism

Biochemistry

Chemicals in living organism

Physiology

“A branch of biology dealing with the functions and activities of living organisms and their parts”

“Physiology is the study of the normal function of cell, tissue, organs, systems and organisms, including all physical and chemical processes.”

Physiology (from Ancient Greek: **physio** = nature; **logos** = study):

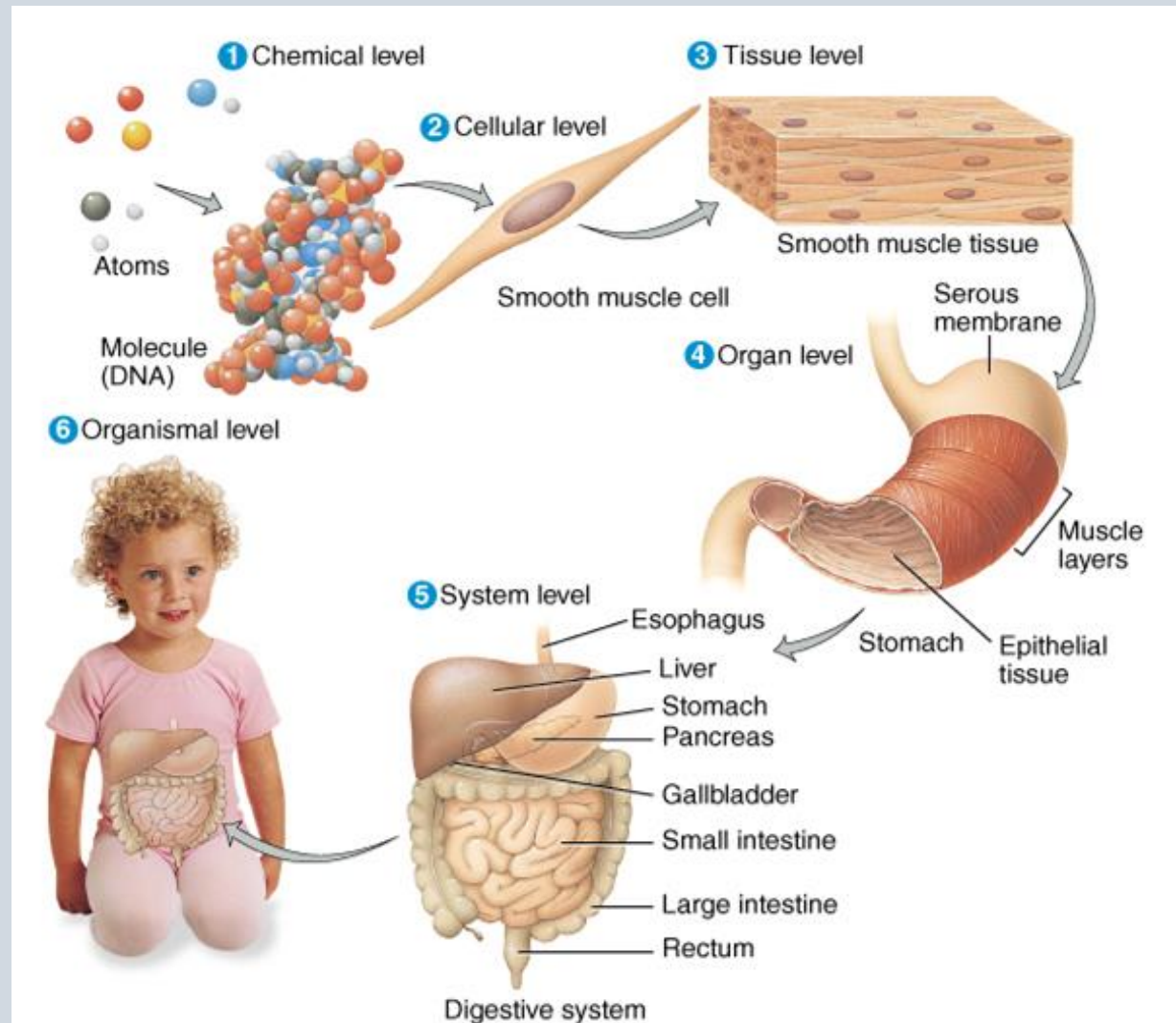
study of how the body works to maintain life

-cell □ tissue □ organ □ organ system □ organism

Human physiology is the scientific study of normal body function.

Levels of Organization

- Chemical
- Cellular
- Tissue
- Organs
- System Level



Levels of Organization

- At the chemical level, *atoms*, *molecules*, and the chemical bonds between atoms provide the framework upon which all living activity is based.
- The *cell* is the smallest unit of life. The entire body contains about 100 trillion cells.
- A *tissue* is a group of similar cells performing a common function. 4 basic tissue types: epithelium, muscle, connective tissue, and nerve

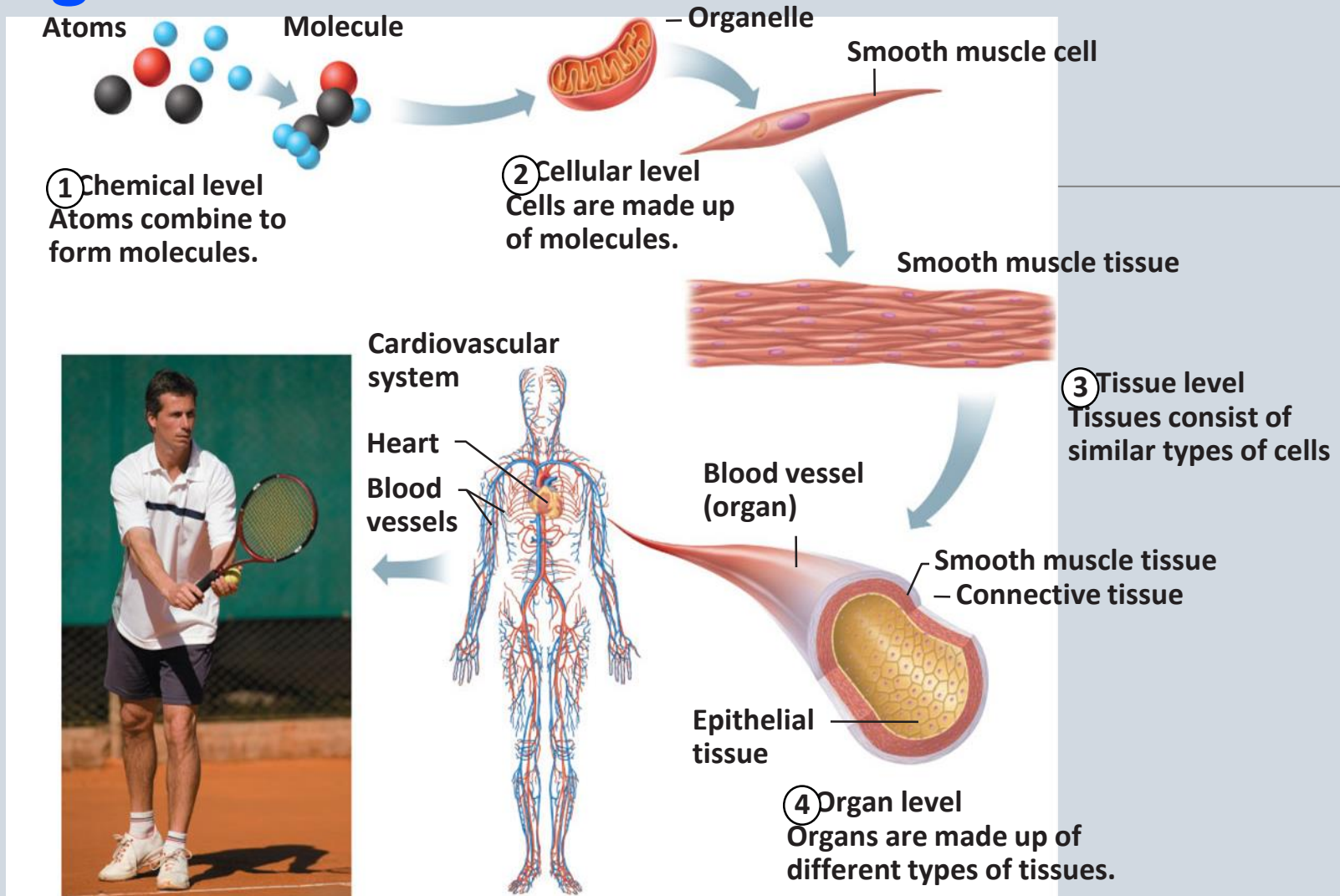
➤ An *organ* is a group of different kinds of tissues working together to perform a particular activity. The heart is an organ composed of muscle, nervous, connective, and epithelial tissues.

➤ An *organ system/body system* is two or more organs working together to accomplish a particular task.

For example digestive system, involves the coordinated activities of many organs, including the mouth, stomach, small and large intestines, pancreas, and liver.(Do not act in isolation from one another)

➤ Organismic level - one living individual

Organism Level



All Our body system are working together to carry out all needed life functions in a coordinated way.

Growth

Repair of injuries

Get energy

Get building materials

Get rid of waste

Keep away disease

Respond to changing environment

Reproduce

➤ Human body has 11 systems

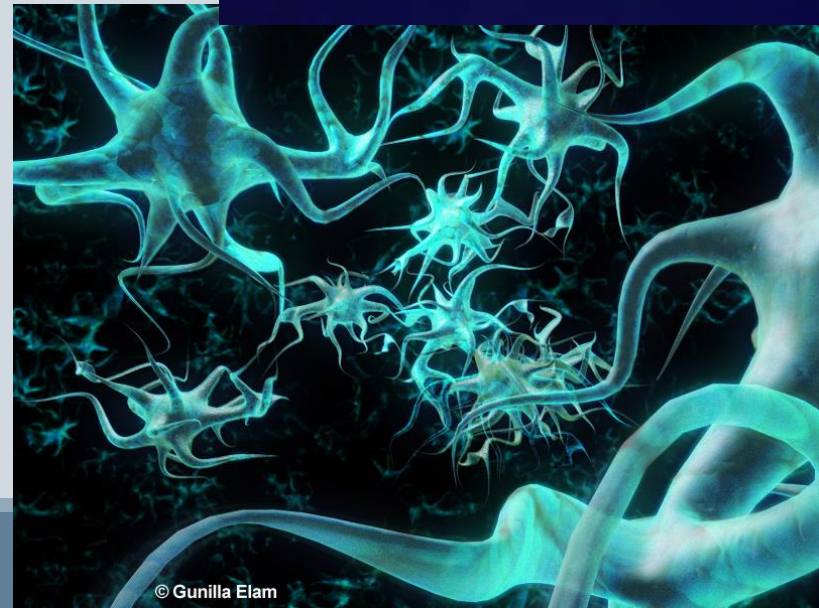
Eleven Body Systems work together to maintain homeostasis and carry out these tasks:

- 1. Nervous System**
- 2. Endocrine System**
- 3. Lymphatic System**
- 4. Circulatory System**
- 5. Respiratory System**
- 6. Digestive System**
- 7. Excretory System**
- 8. Skeletal System**
- 9. Muscular System**
- 10. Integumentary System**
- 11. Reproductive System**

1. Nervous System:

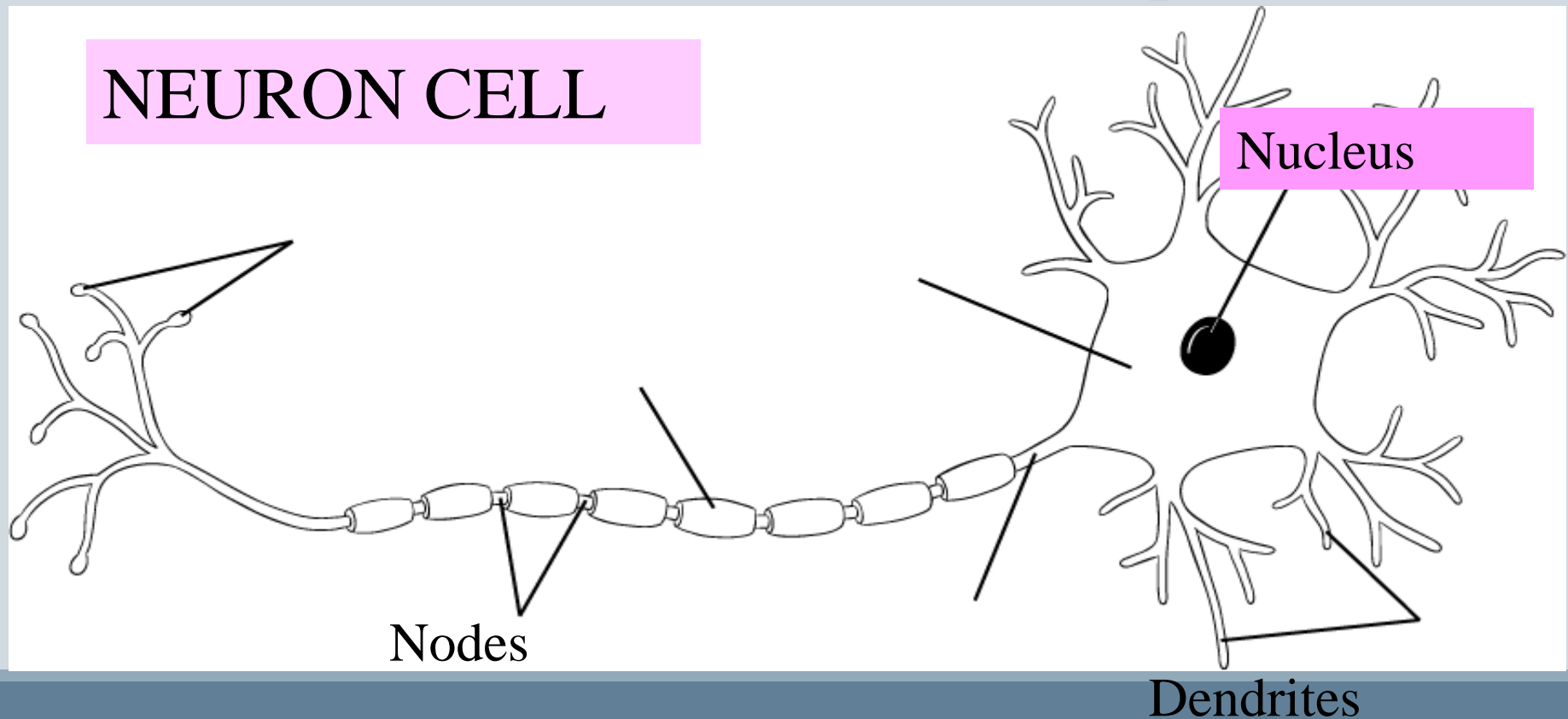
Structures: Brain, Spinal Cord, Peripheral Nerves, Neurons (Cells of nervous system)

Functions: Coordinates the body's response to changes to internal and external environment



The Nervous System:

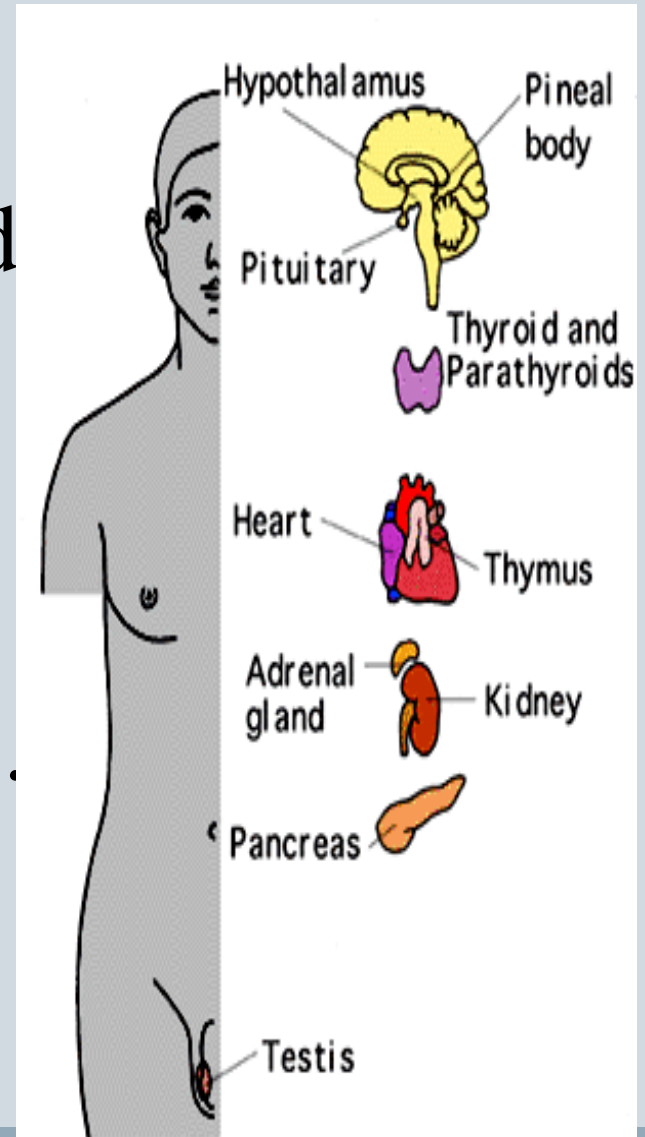
The nervous system is the number one communication center of the body. The basic cell type that carries the communications is a network of neurons that transmit electrical impulses.



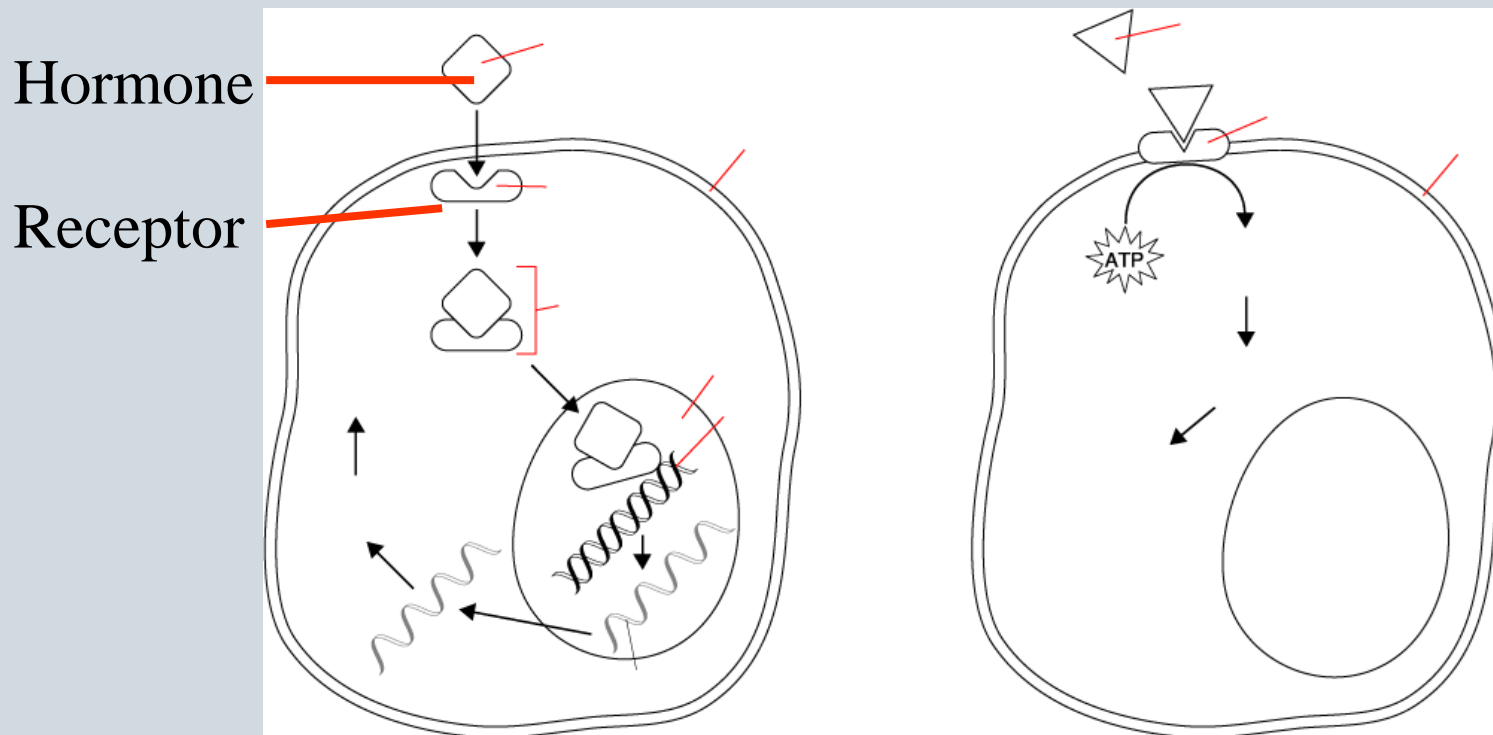
2. Endocrine System – Hormone System

Structures: Glands - Hypothalamus, pituitary, thyroid parathyroids, adrenals, pancreas, ovaries (in females), testes (in males)

Functions: Produce Hormones. Controls growth, development, metabolism, and reproduction



The Endocrine System Sends messages throughout the body by way of chemicals known as hormones. Hormones travel throughout the blood stream to **target cells which contain matching receptors.**



Hypothalamus

Pineal Gland

Pituitary

Thyroid

Pancreas

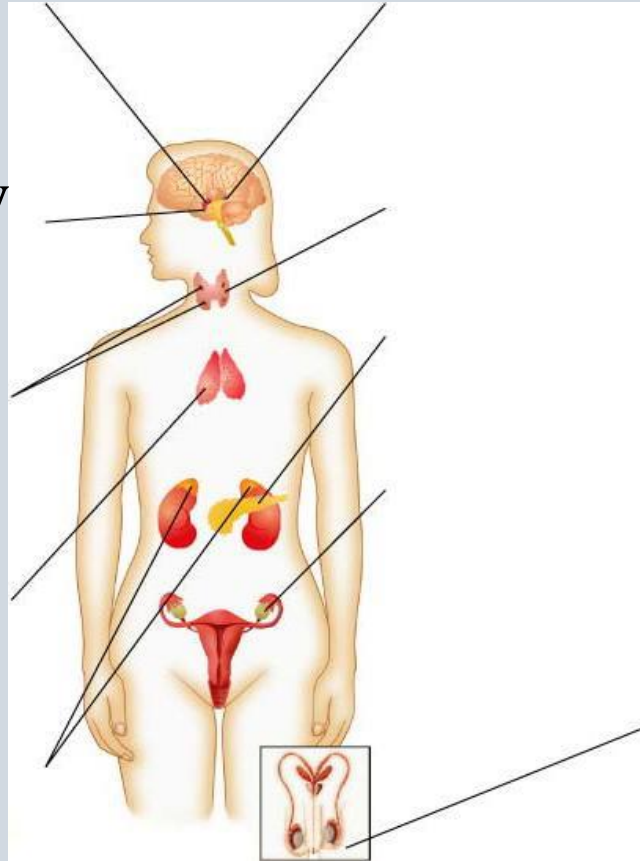
Parathyroids

Thymus

Adrenal
Glands

Ovary (female)

Testis
(male)



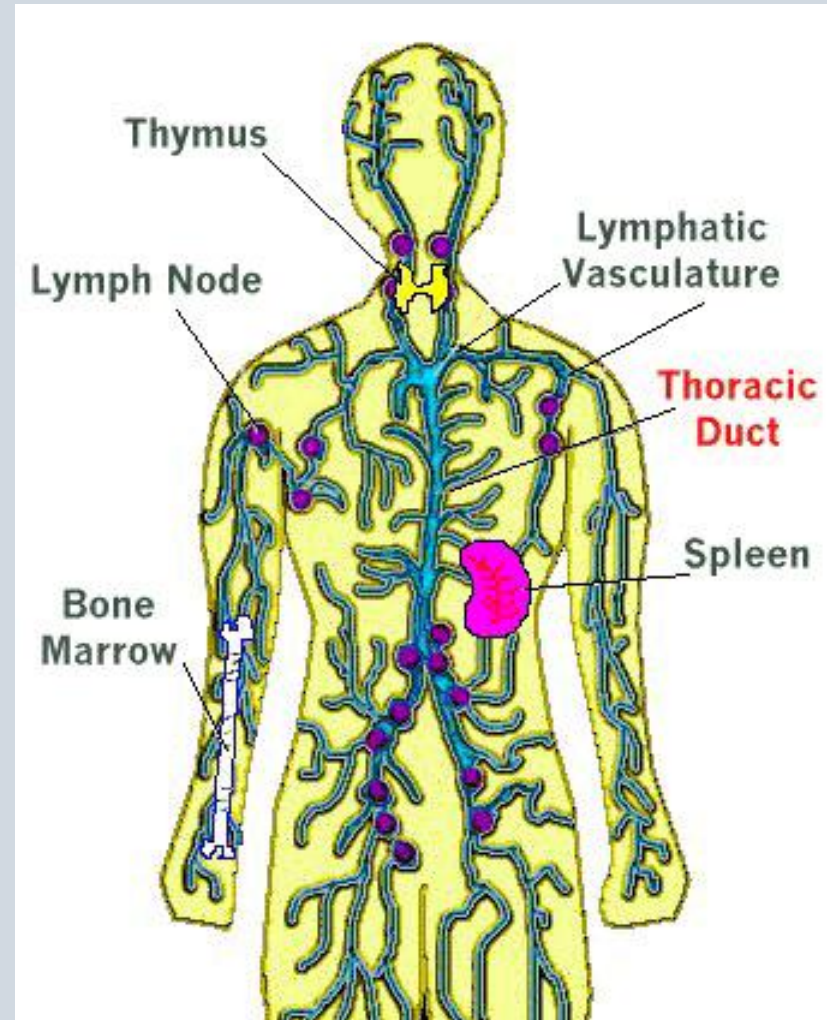
Important Glands and Hormones of the Human Body

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

3. Lymphatic System – Immune System

Structures: White blood cells, thymus, spleen, lymph nodes, lymph vessels

Function: Collects fluid that lost from blood vessels, leaks into body tissues and returns it to the circulatory system

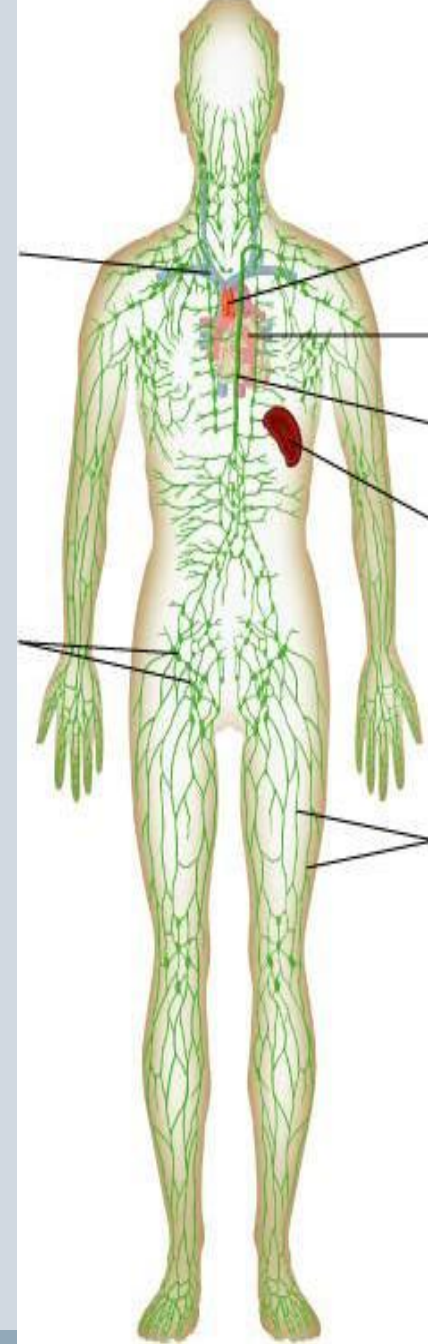


Helps to protect the body from disease;

Lymph nodes filters that collected invaders that cause disease.

Superior Vena
Cava

Lymph
Nodes



Thymus

Heart

Thoracic

Duct

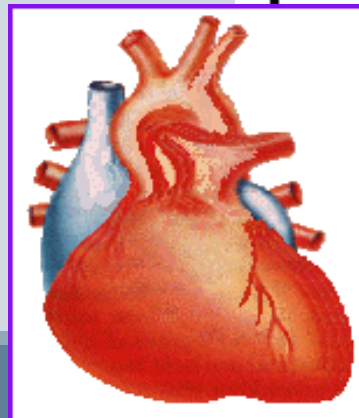
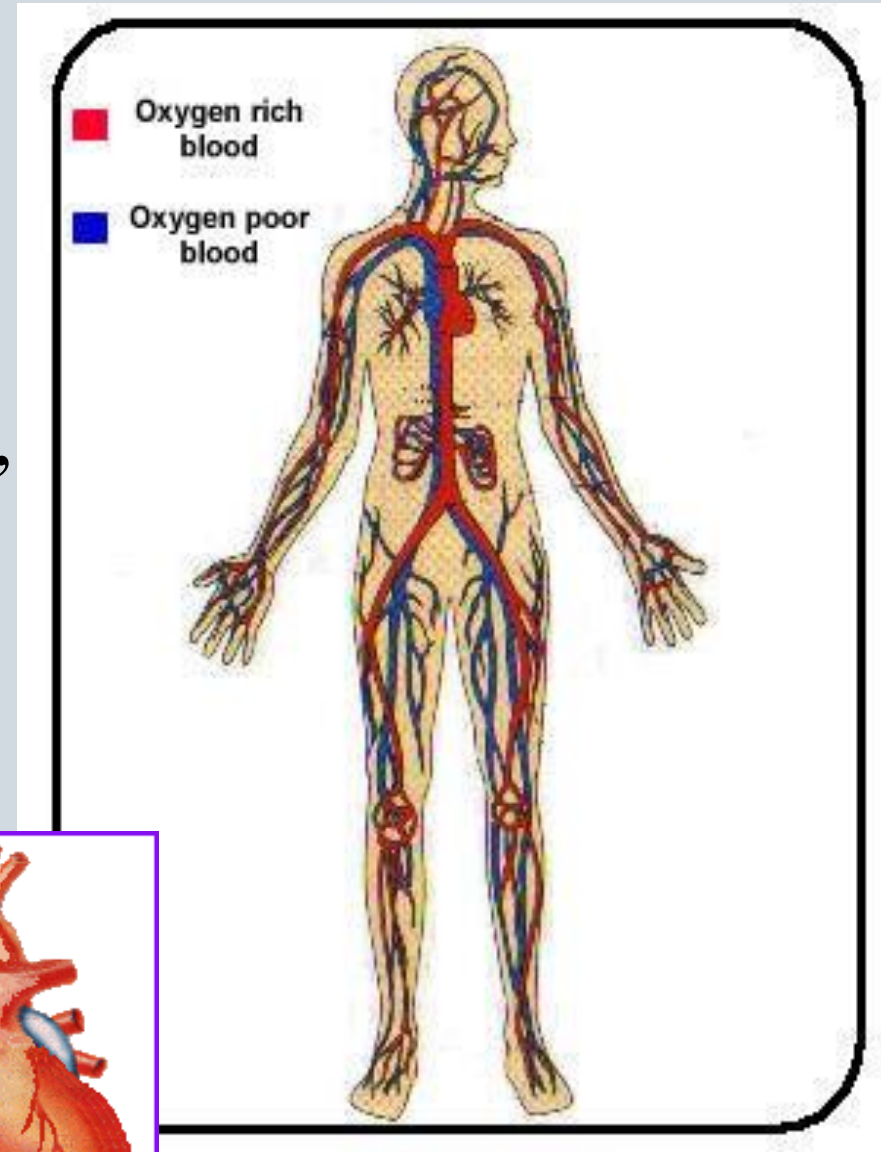
Spleen

Lymph
Vessels

4. Circulatory System

Structures: Heart, Blood vessels, blood

Functions: Brings oxygen, nutrients, and hormones to cells; fights infection; regulates body temperature.



5. Respiratory System

Structures: Nose, pharynx, larynx, trachea, bronchi, bronchioles, lungs

Functions: Provides oxygen needed for cellular respiration and removes carbon dioxide from body.

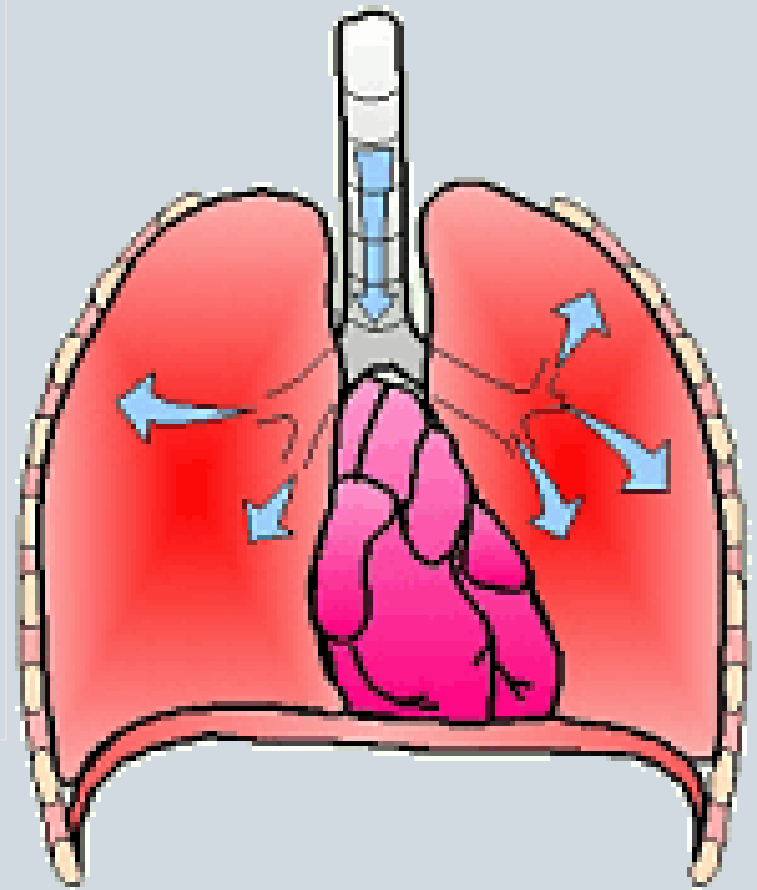
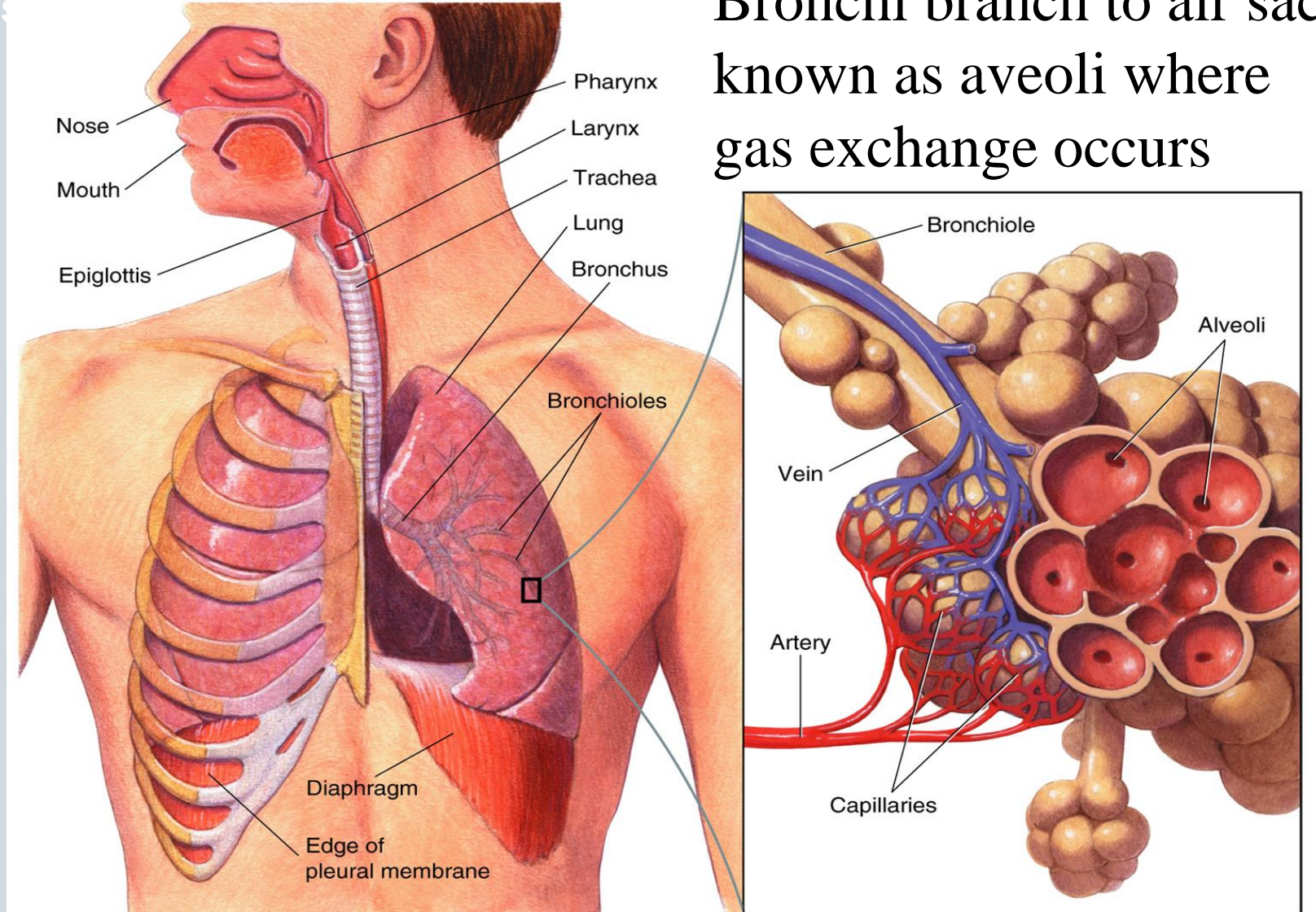


Figure 37-13 The Respiratory System

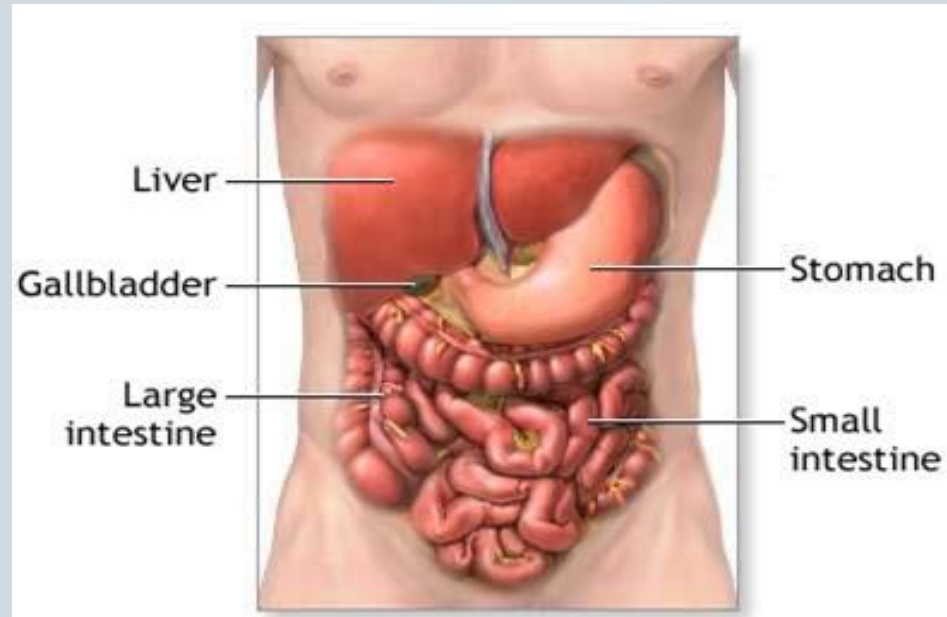
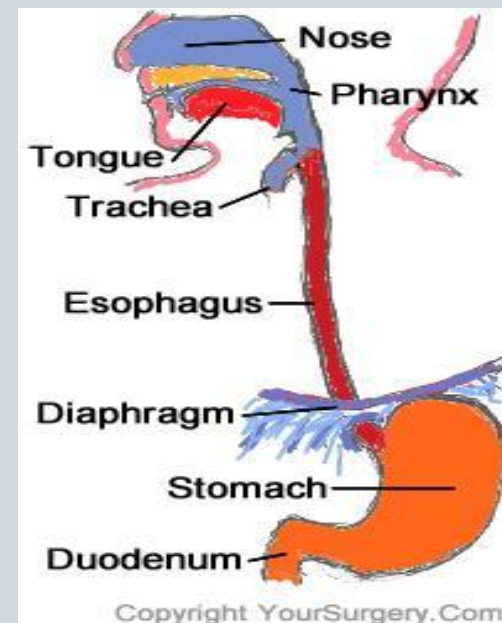
Bronchi branch to air sacs known as aveoli where gas exchange occurs



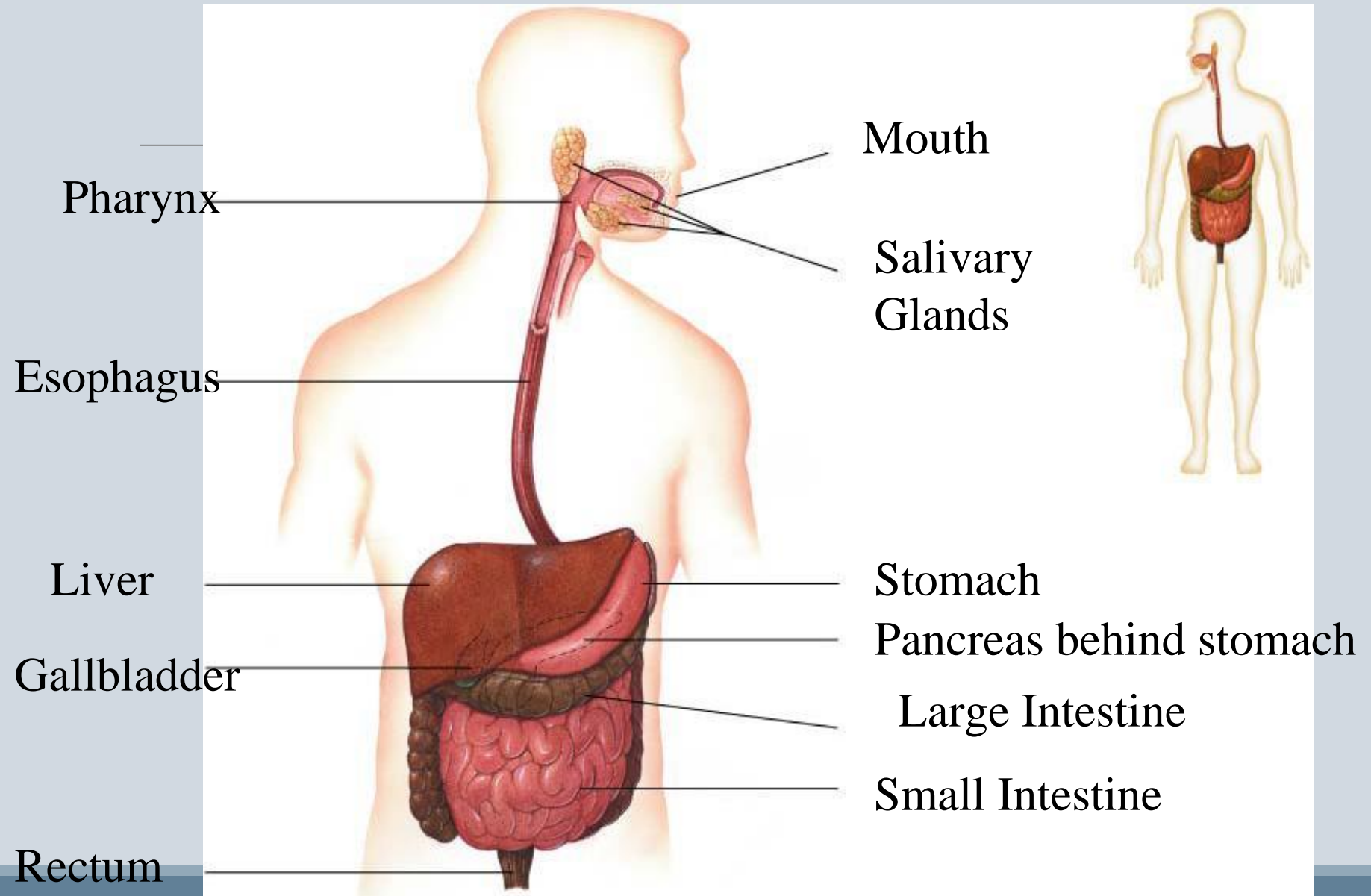
6. Digestive System

Structures: Mouth, pharynx, larynx, esophagus, stomach, liver, pancreas, small and large intestines,

Function: Breaks down foods into simple molecules that can be used by the body for respiration and building cells



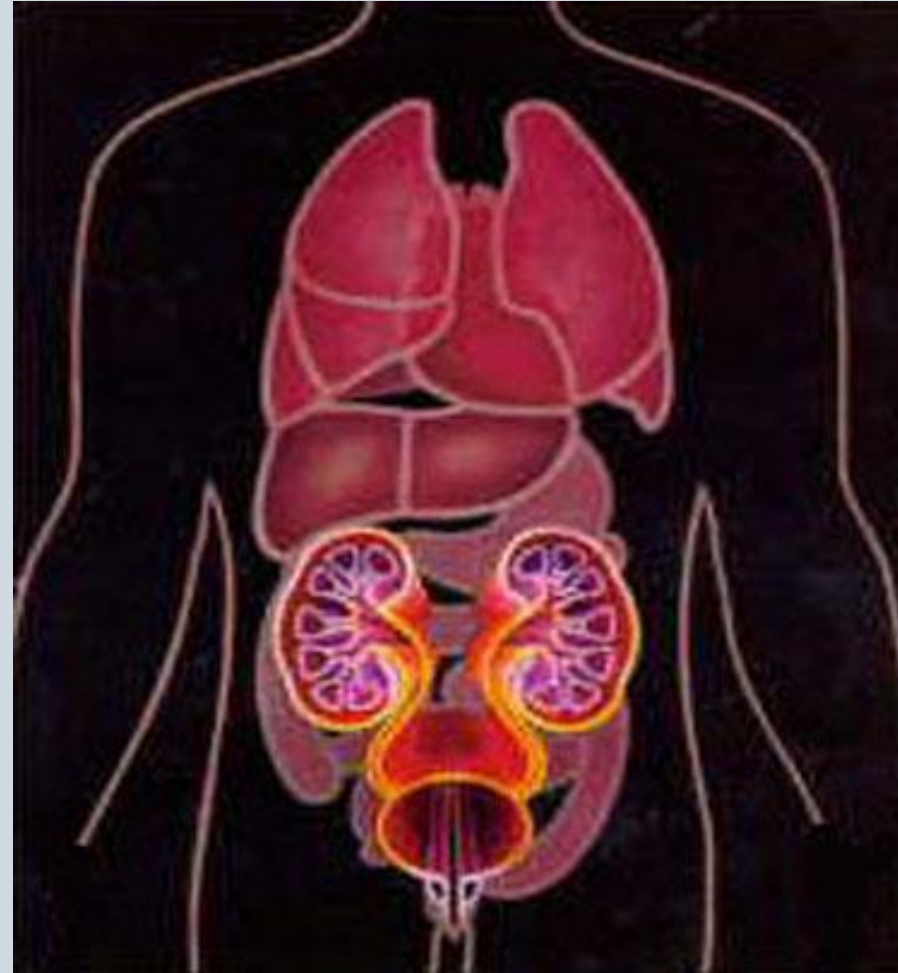
The Digestive System



7. Excretory System

Structures: Skin, lungs, kidneys (nephrons), ureters, urinary bladder, urethra

Functions: Removes waste products of metabolism from the body



Excretory System:

In the process of obtaining nutrients and carrying out chemical reactions the human body produces wastes (CO₂, Urea, Salts). If some of these wastes are not removed they could threaten our health. Excess chemicals that are not toxic also need to be removed.

Other important parts of the bodies excretory system

- The skin excretes excess water and salts
- The lungs excrete carbon dioxide produced from respiration



Both of these body organs serves multiple functions in the human body.

8. Skeletal System

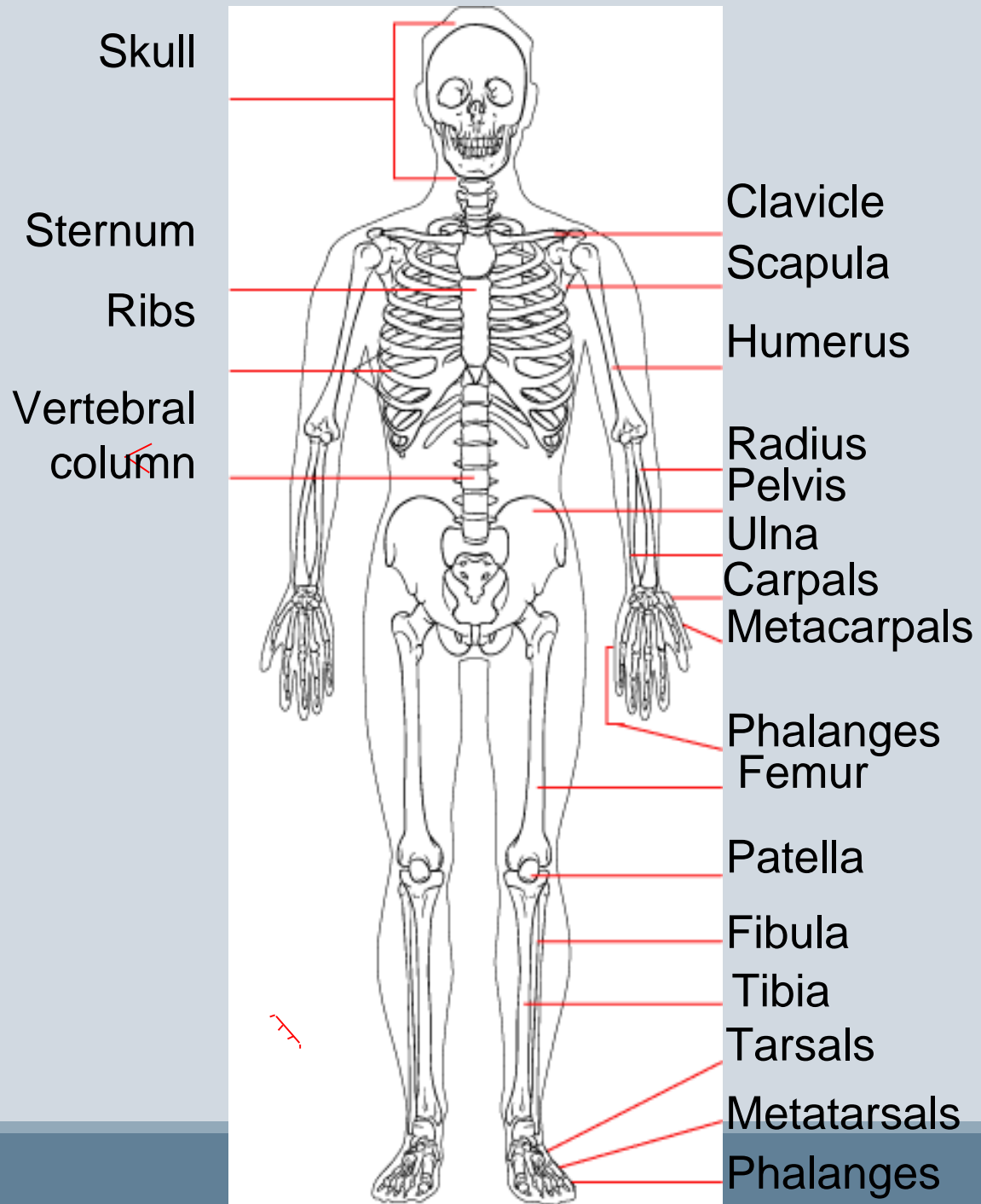
Structures: Bones, cartilage, ligaments, tendons

Functions: Supports the body; protects internal organs; allows movement; stores mineral reserves; provides a site for blood formation



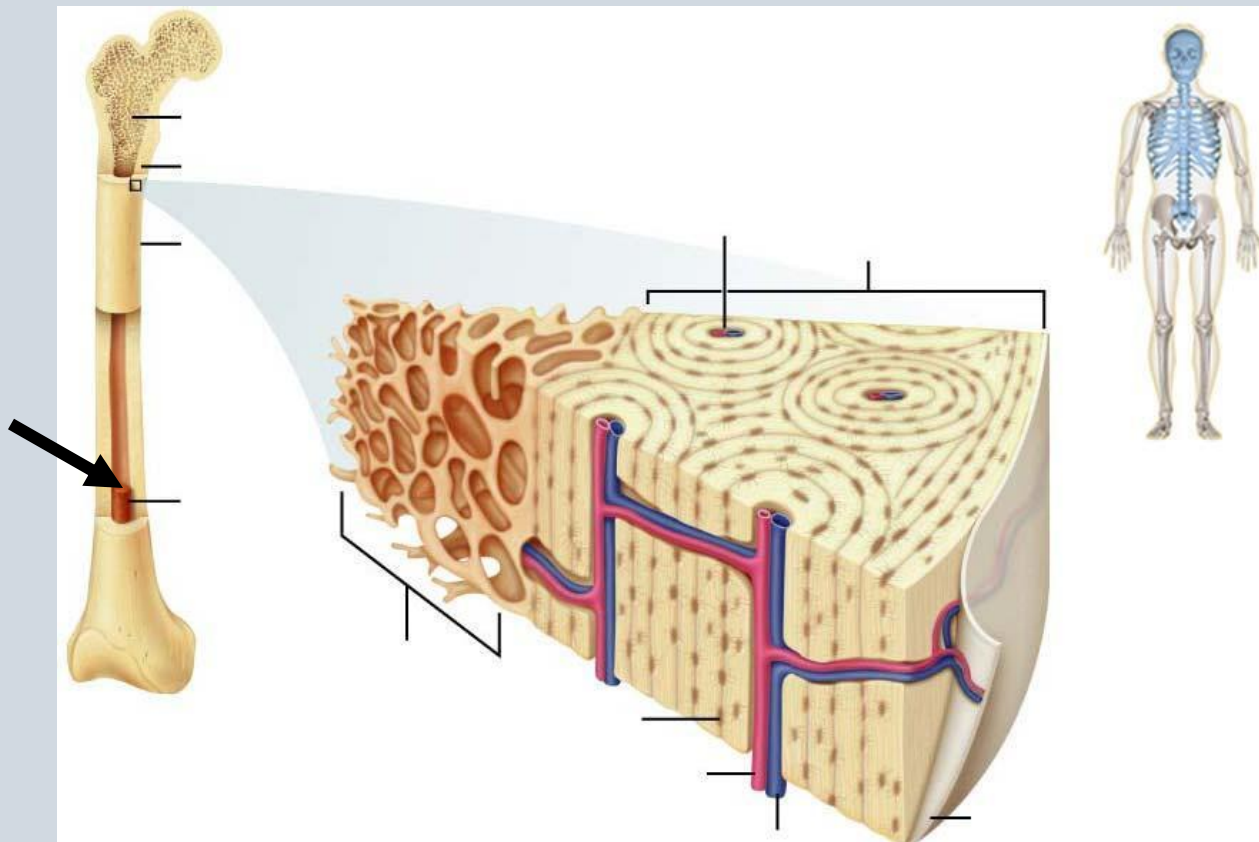
A. Skeletal System

There are 206 bones in the adult human body. These bones provide a system of supports and levers on which muscles can produce movement



Bones are a solid network of living cells and protein fibers that are surrounded by calcium deposits.

Bone
Marrow



Joints are places where one bone attaches to another.

Ball-and-Socket Joint

Clavicle



Pivot Joint

Elbow



Hinge Joint

Knee



Saddle Joint



Freely Movable Joints and Their Movements

9. Muscular System

Structures: Skeletal muscle, smooth muscle, cardiac muscle

Function: Works with skeletal system to produce voluntary movement; helps circulate blood and move food through the digestive system



The Muscular System

More than 40% of the average human is muscle. Muscles are involved in both voluntary actions and involuntary actions. Three types of muscles cells are:

- Skeletal – Attached to bones for voluntary actions
- Smooth – Found in body's visceral organs e.g digestive tract and the blood vessels to move food and blood.

Control involuntary actions (you do not decide for them to work)

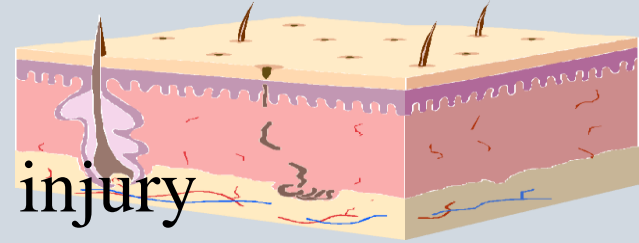
- Cardiac – Heart muscle cells are involuntary.

10. Integumentary System (Skin)

Structures: Skin, Hair, Nails, Sweat and Oil Glands

Functions:

- Serves as a barrier against infection and injury
- Helps regulate body temperature
- removes excess salts and water
- Protects internal cells from UV radiation
- Serves as one link between the nervous system and the environment (receives information on pressure, temperature, pain)



Hair and Nails are made up of a substance known as **keratin**. They are both used to protect the skin from damage:

- Fingernails and toe nails protect the tips of your toes and fingers
- Hair on your head protects from UV rays
- Eyelashes, Nose Hair and Ear Hair prevent dirt and other particles from entering the body.



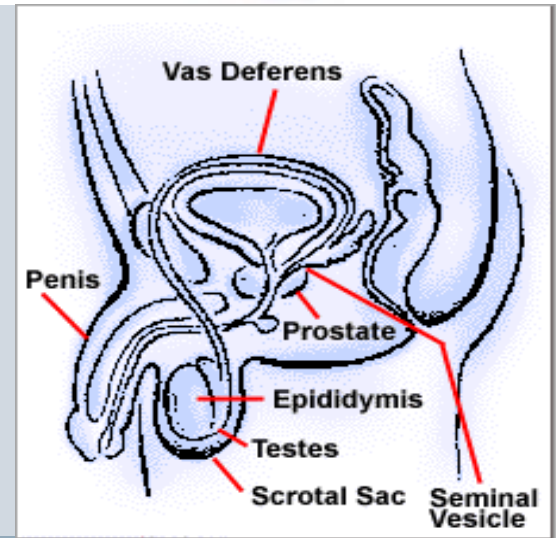
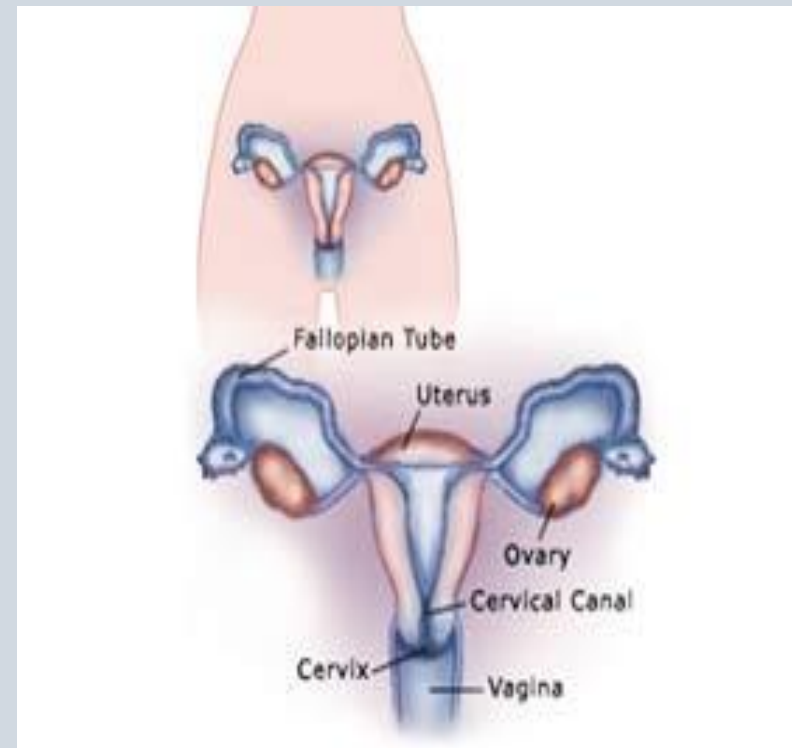
11. Reproductive System

Structures:

Female- Uterus, Fallopian tubes, ovary, cervical canal, cervix, vagina

Male – Penis, Vas Deferens, Prostate, Epididymis, Testes, Scrotal Sac, Seminal Vesicle

Function: Produces reproductive cells; in females nurtures and protects developing embryo



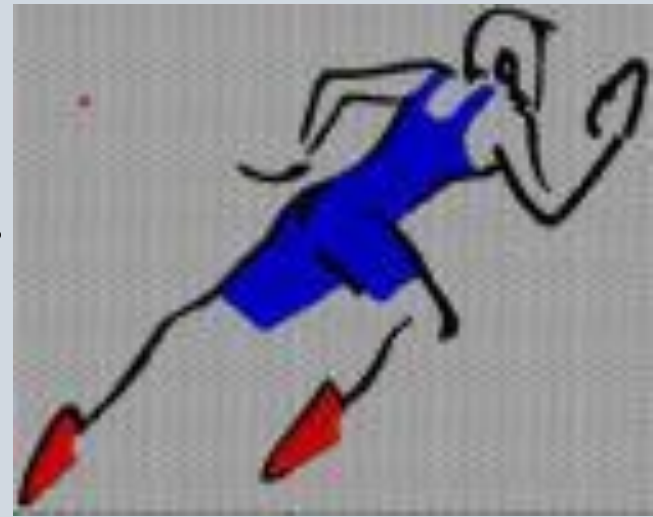
All Our body system are working together to carry out all needed life functions in a coordinated way.

- Human Body Regulate all these body systems and make them work together with the help of

Nervous System & Endocrine System

- The **Respiratory System** links to the **Circulatory System** to provide cells with oxygen and remove carbon dioxide.

➤ We 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.



➤ The **Digestive and Excretory Systems** together are responsible for bringing in food and getting rid of the leftovers.



Scope and Relevance of Physiology to Dentistry

Physiology is the branch of science that deals with the normal functions of the human body.

In dentistry, physiology provides the fundamental understanding required to diagnose, treat, and prevent oral and systemic diseases.

In dentistry, understanding physiology is essential because dental practice deals directly with living tissues and their functions.

Scope of Physiology in Dentistry

1. Oral and Dental Physiology

Structure and function of teeth, periodontium, oral mucosa, tongue, and salivary glands

Saliva formation, composition, and functions

Mastication, deglutition (swallowing), and speech

2. Neurophysiology

Sensation of pain, touch, pressure, and temperature in oral tissues

Trigeminal nerve function

Mechanism of local anesthesia

3. Muscle Physiology

Muscles of mastication and facial expression

Jaw movements and occlusion

4. Muscle Physiology

Muscles of mastication and facial expression

Jaw movements and occlusion

5. Cardiovascular Physiology

Blood supply to oral tissues

Management of patients with hypertension, heart disease, and shock.

6. Endocrine Physiology

Hormonal influences on growth, tooth eruption, bone metabolism, and periodontal health.

7. Hematological and Immune Physiology

blood clotting, healing, and defense mechanisms

Management of bleeding disorders and infections

Relevance of Physiology to Dentistry

Basis for Clinical Practice

Helps understand normal oral functions and identify abnormalities

Pain Control and Anesthesia

Essential for safe and effective use of local and general anesthesia

Diagnosis and Treatment Planning

Understanding systemic conditions affecting oral health

Dental Materials and Procedures

Tissue response to restorative materials, implants, and prostheses

Management of Medically Compromised Patients

Safe dental care for patients with systemic diseases

Prevention and Health Promotion

Understanding saliva, diet, and oral defense mechanisms

Conclusion

Physiology provides the scientific foundation for dentistry. A thorough knowledge of physiological principles enables dentists to diagnose accurately, treat safely, manage systemic conditions, and promote oral and general health effectively.