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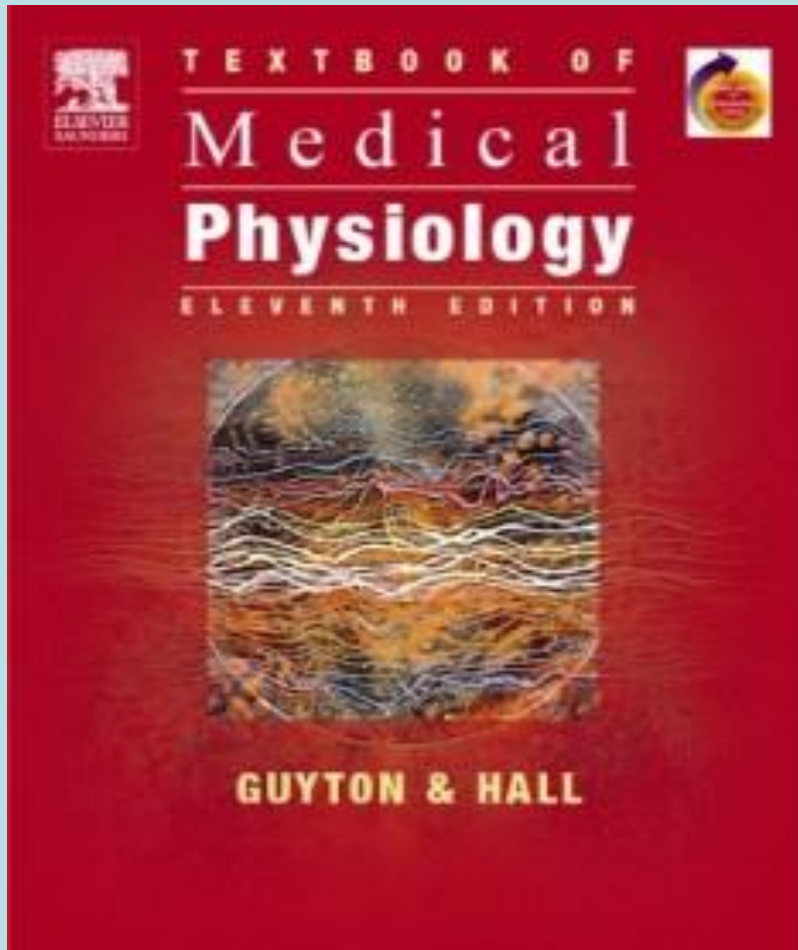
Physiology lectures in Foundation Block

Introduction, body fluids, cell membrane structure and homeostasis	5 lectures
Autonomic nervous system I & II	2 lectures
Blood Physiology	6 lectures
	<u>13 lectures</u>

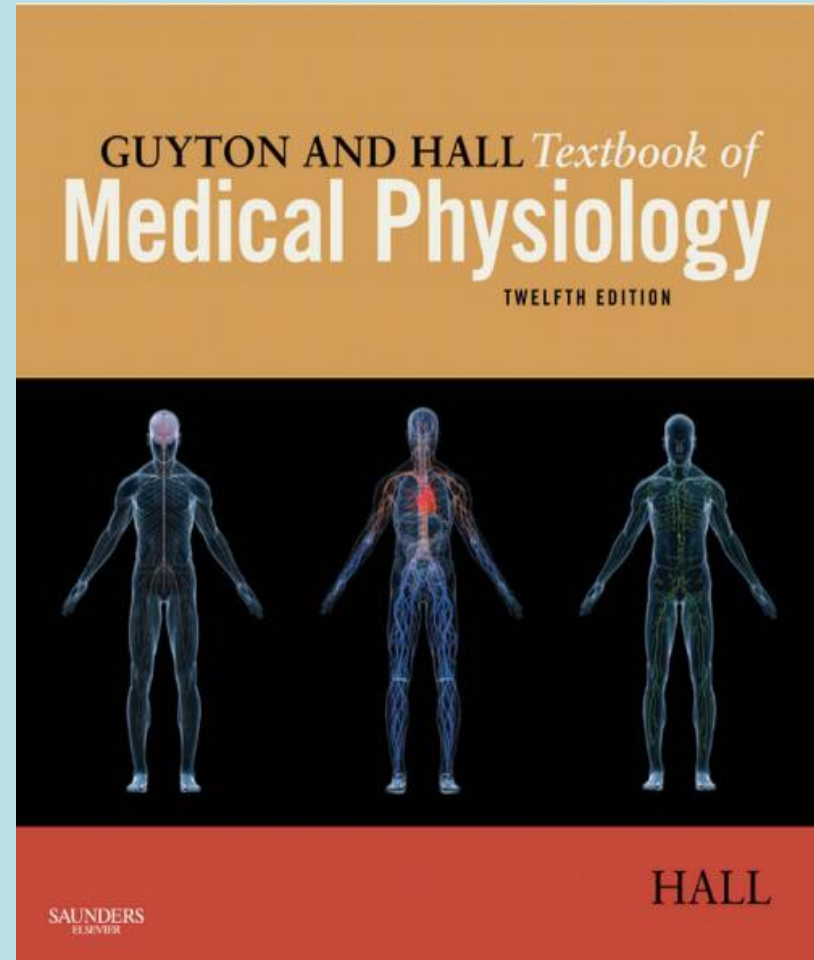
Introduction to Physiology



- Physiology is one of the **cornerstones** of medicine.
- Physiology is the study of **how the body works**, the ways in which cells, organs and the whole body functions, and how these functions are maintained in a changing environment.
- ***Cellular physiology*** is the study of the cellular components that primarily determines organ function.
- ***Systems physiology*** is the study of the coordinated and networked processes that determine whole body function and adaption to change.



11th



12th



Lecture 1:

Functional Organization of the Human Body

Objectives



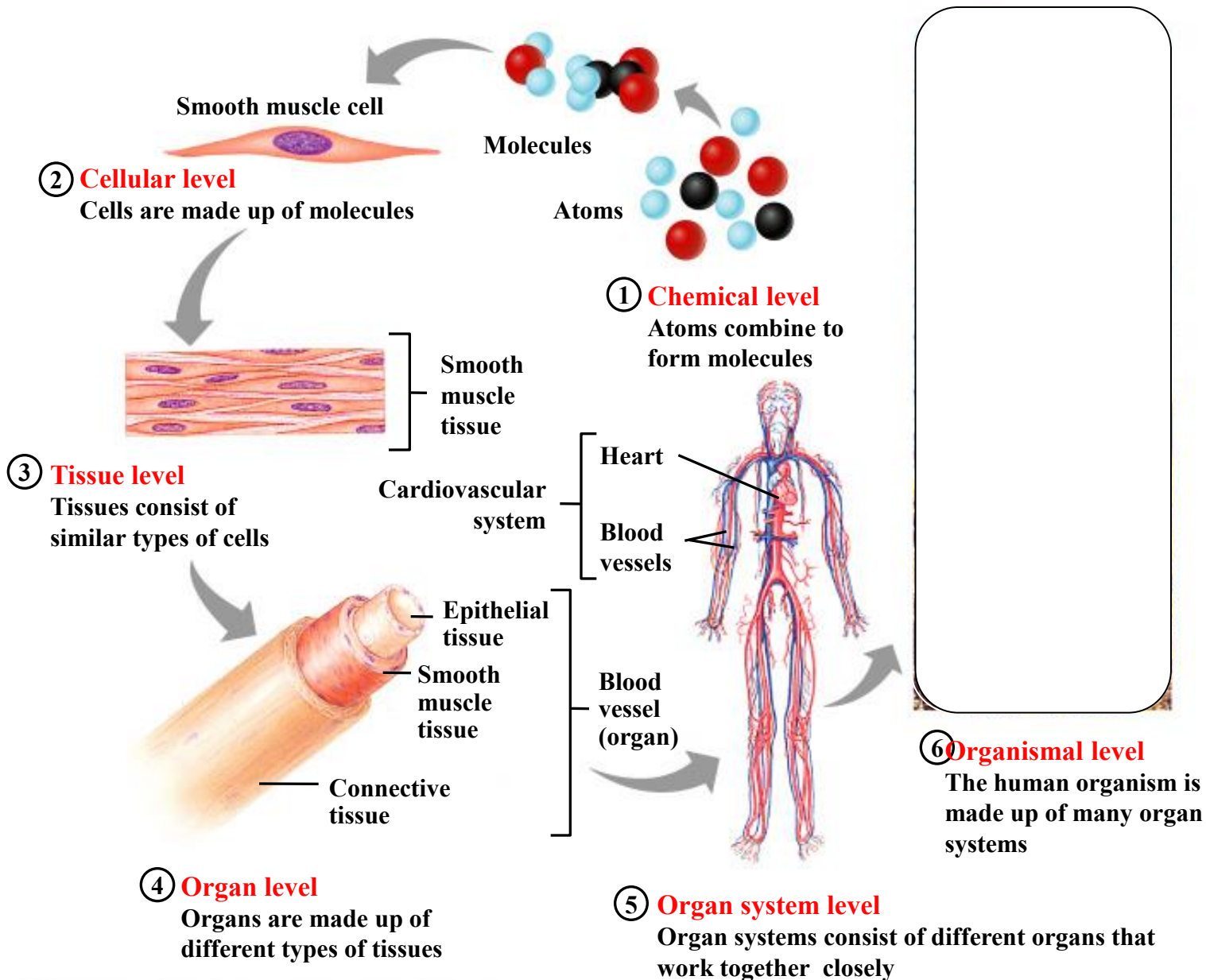
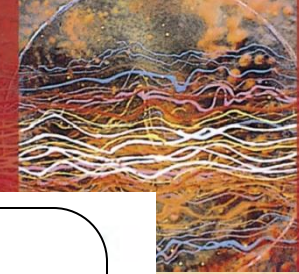
- Understand the level of body organization
- Distinguish the primary tissues and their subtypes
- Recognize the regulation of extracellular fluid transport and mixing system

Levels of Organization



- **Cells:** the basic structural and functional unit (~ 100 trillion)
- **Tissues:** (e.g. muscles, epithelial, nervous)
- **Organs:** (e.g. kidney, heart, liver, pancreas)
- **Organ systems:** (e.g. cardiovascular, respiratory, urinary)

Levels of Structural Organization



THE PRIMARY TISSUES

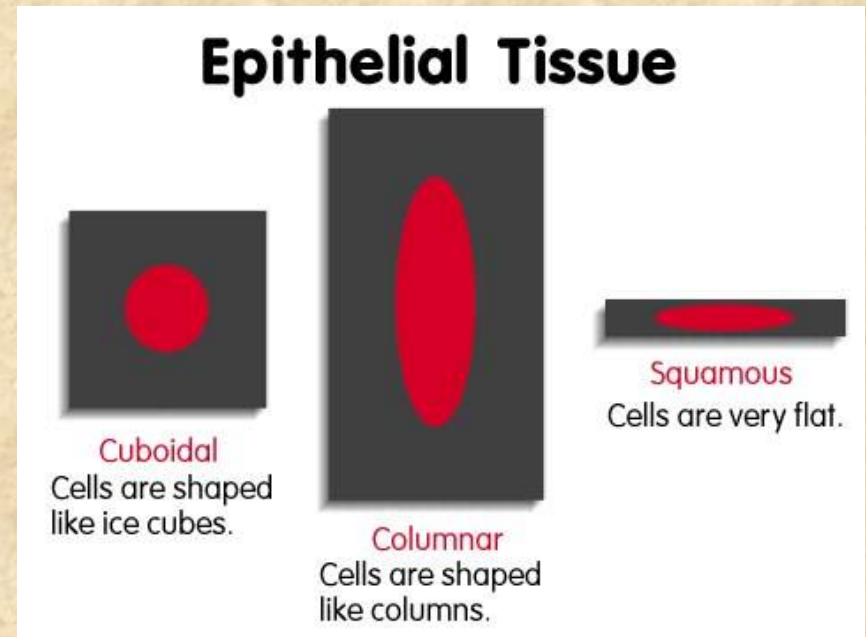


- **FOUR MAJOR TYPES OF TISSUES IN THE HUMAN BODY:**
- **EPITHELIAL**: Covers body surfaces and lines body cavities
- **CONNECTIVE**: Binds and supports body parts
- **MUSCULAR**: Causes body parts to move
- **NERVOUS**: Responds to stimuli and transmits impulses from one body part to another

EPITHELIAL TISSUES: covers body, lines cavities



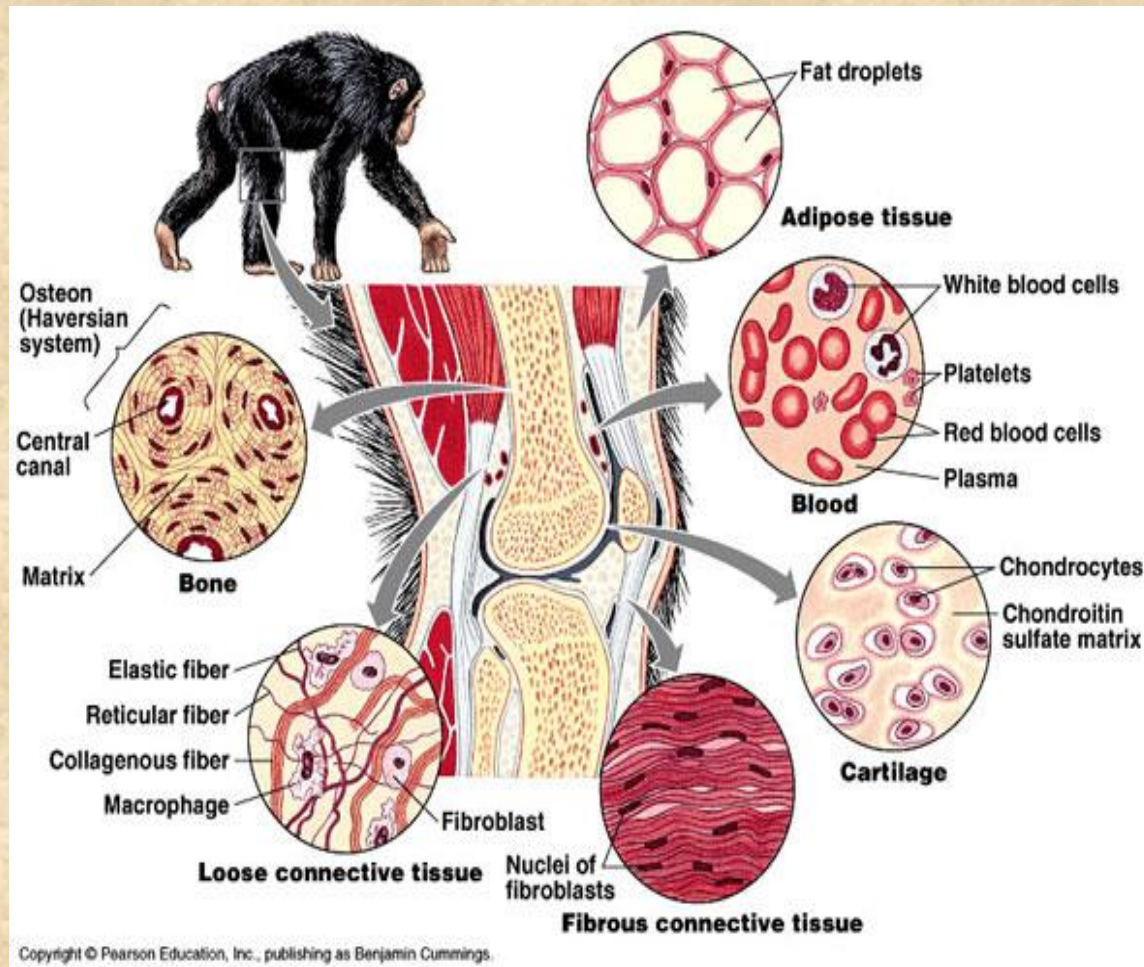
- Covers entire body surface and most of the body's inner cavities.
- Outer epidermis (skin) **protects from injury and drying out**
- Inner epidermal tissue, on internal surfaces protects, secretes mucus (e.g. along digestive tract)



CONNECTIVE TISSUES

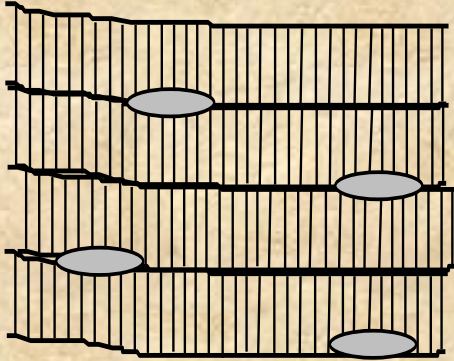


- **Connects organs**
- *Functions:*
- bind structures together
- fill up spaces
- provide support and protection
- store fat



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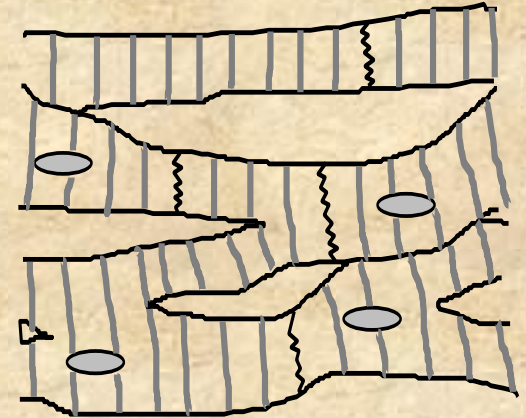
Muscle Tissues: Contract for Movement



Skeletal Muscle
Striated
Voluntary



Smooth Muscle
Non-striated
Involuntary



Cardiac Muscle
Striated
Involuntary

Muscle Tissues



SKELETAL MUSCLE:

striated (alternating light and dark bands)
attached to bones,
used for movement
voluntary control.
Can contract quickly and strongly but will fatigue in time.

SMOOTH MUSCLE:

non-striated,
involuntary control,
found in walls of
internal organs,
intestine, stomach,
blood vessels.
Contracts more slowly,
but can contract over a
longer period of time.

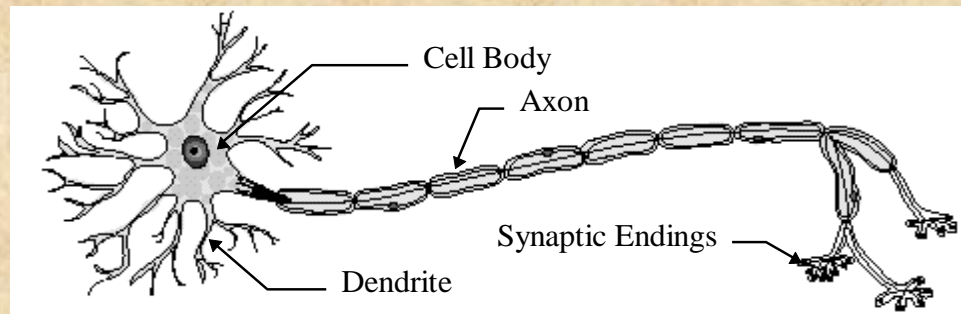
CARDIAC MUSCLE:

striated, involuntary,
forms heart muscle.
Found only in the
heart.
Can contract quickly,
and beats your whole
life through.

Nervous Tissues: Conduct Electrochemical Messages



- Specialized tissue that forms **nerves**, **brain**, **spinal cord**
- Conduct electrical & chemical messages along special cells called neurons. Composed of **cell body**, **dendrites** (conduct messages *to* cell body), **axon** (send messages *away* from cell body).

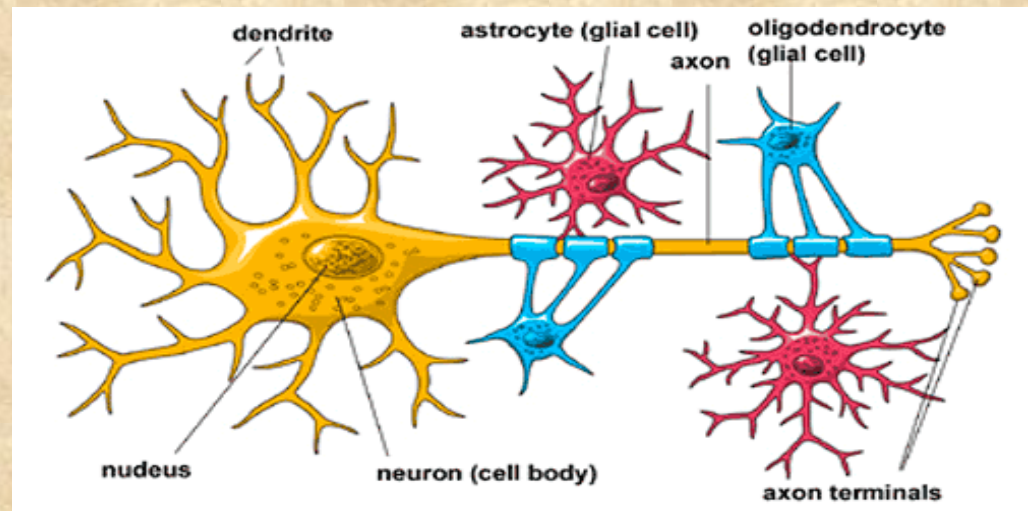


Structure of a Neuron (in this case, a *motor neuron*)

What are Glial cells?



- **Glial** cells are cells that surround nerve cells. They help to support, protect, and nourish nerve cells. They provide nutrients to the neurons and help keep the tissue free of debris.



What are Glands?



- **Gland**: a single cell, or a collection of cells that **secrete** chemicals
- **i. Exocrine glands**: secrete into **ducts**. e.g. the gall bladder is an exocrine gland because it secretes bile in a duct. Sweat glands are exocrine glands.
- **ii. Endocrine glands**: secrete chemicals (especially **hormones**) into **bloodstream** (e.g. pituitary gland, pancreas secretes insulin into the blood).

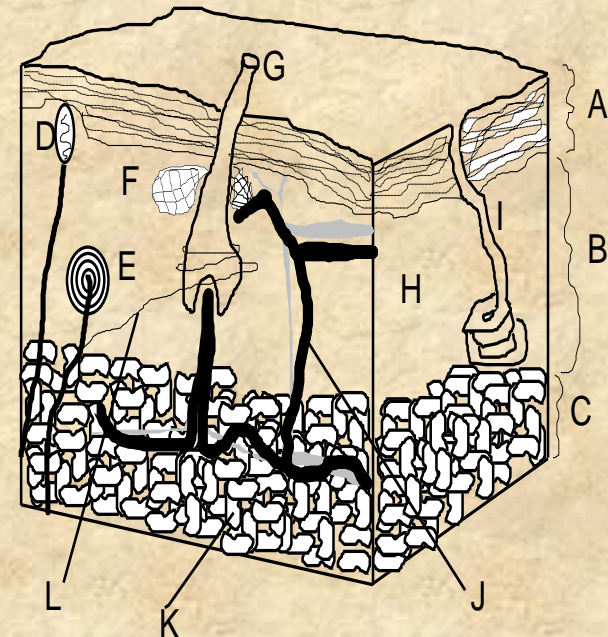
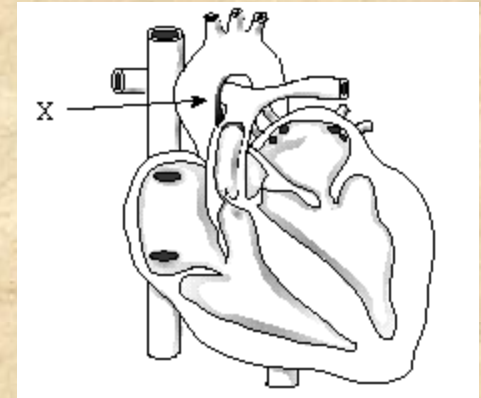
ORGANS: Tissues working together



❑ Organs (e.g. the heart) are made up of **one or more types of tissues** (usually more).

❑ **SKIN** is also an example of an organ. It is the largest organ, and has several tissue layers.

Skin **covers** body surfaces, gives **protection** from water loss and invasion by microorganisms, contains **sense organs**, helps to regulate body temperature



Human Organ Systems

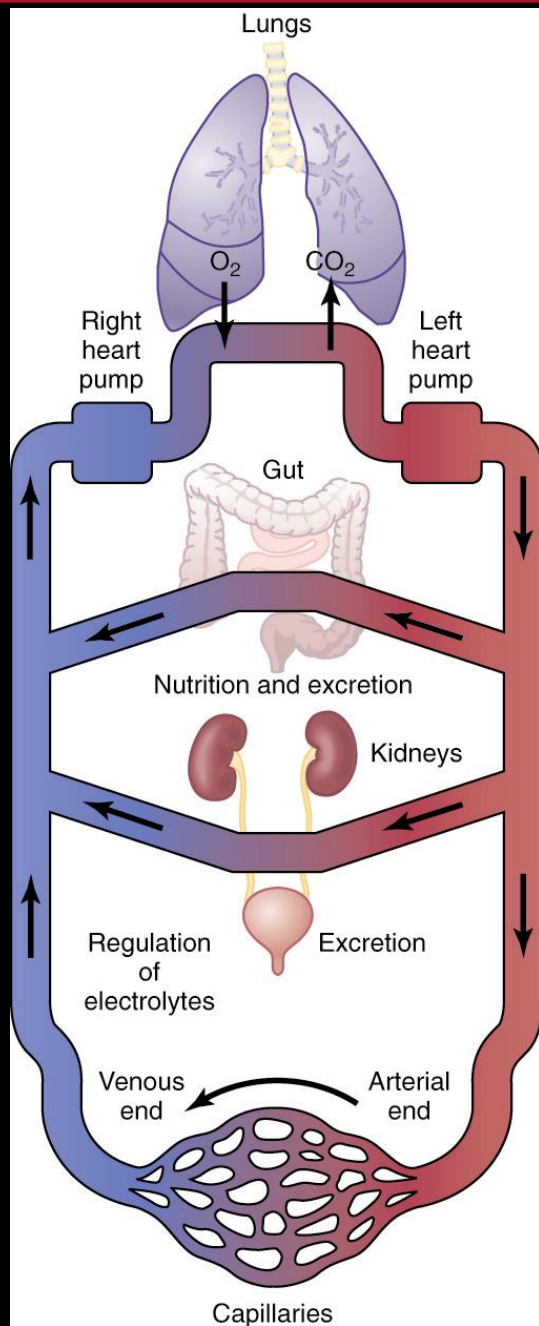


- Each located in specific location, with specific functions. (e.g. digestive system).
- Many internal organ systems enclosed within **coelom**, a cavity within the body.
- Organ systems contribute to maintaining a stable internal environment (**homeostasis**). e.g. Temp, pH, [glucose], blood pressure.

Function of Organ Systems



1. Digestive	convert food to usable nutrients
2. Circulatory	transport of necessary molecules to cells
3. Immune	defense against invading pathogens
4. Respiratory	gas exchange
5. Excretory	gets rid of metabolic wastes
6. Nervous & Sensory	regulation and control, response to stimuli, processing information
7. Muscular & Skeletal	support and movement
8. Hormonal	regulation of internal environment, development
9. Reproductive	producing offspring



General Organization of the Circulatory System

Figure 1-1;
Guyton & Hall

Exchange Between the Capillaries and Interstitial Fluid

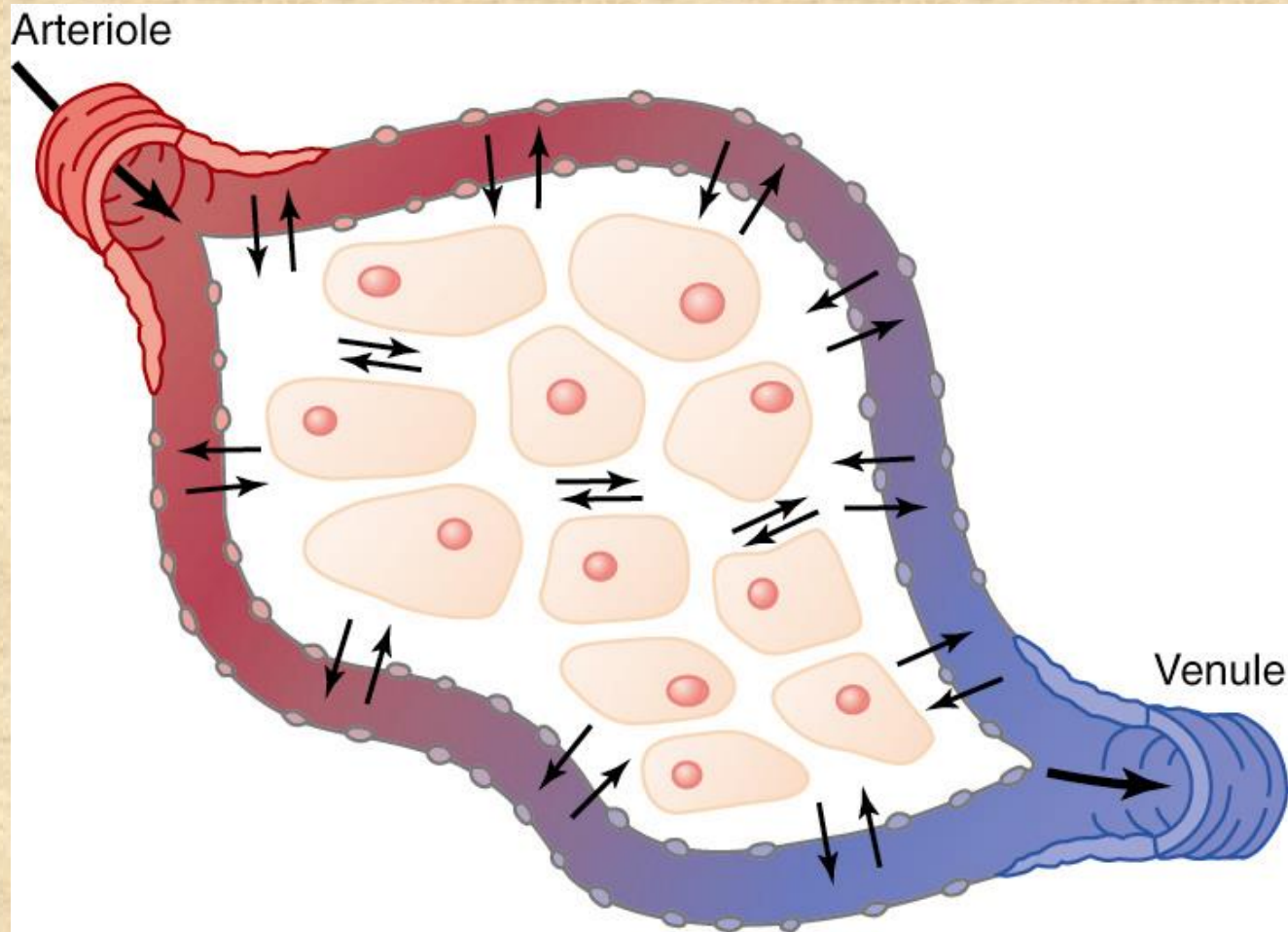


Figure 1-2; Guyton & Hall

Origin of nutrients in the extracellular fluid

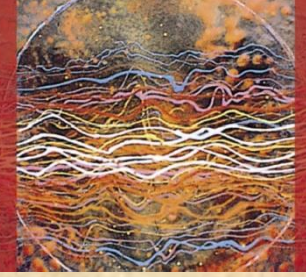


- Respiratory system: O_2
- Gastrointestinal tract:
 - Carbohydrates
 - Fatty acids
 - Amino acids
- Liver and other organs
- Musculoskeletal system

Removal of Metabolic End-products



- CO₂ (by lung)
- Urea, uric acid, excess water and ions (kidneys)
- others



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