◉Sheet ○Slides

Number

1

Done by:

Jafar Sharabati & Omar Bani-ata

Corrected by:

Omar Bani-ata

Doctor

Faisal Mohammed

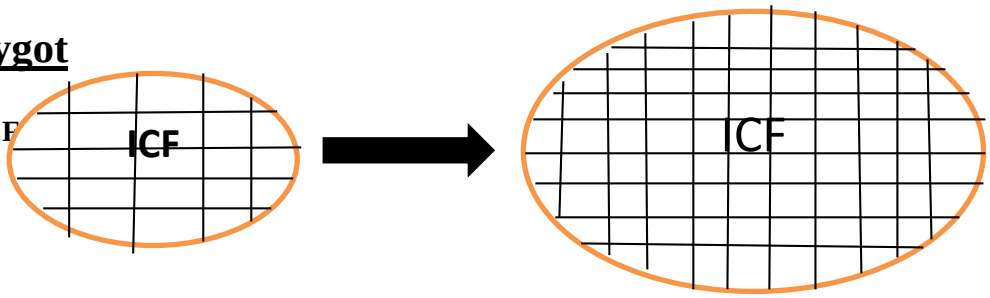
Definitions:

- Anatomy →The science of body **structures** and relationships.
  → First studies by dissection (cutting apart).
  → Imaging techniques.

- Physiology → The science that is concerned with the **function** of the living organism and its parts, and of the physical and chemical processes involved.
  → The science of body functions.

So… Anatomy & physiology complete each other.

Zygot



Abbreviations

ICF: Intracellular fluid.

ECF: Extracellular fluid.

♦ We can observe from the figure above that the cells get increased by dividing the *zygot*. As a result, some cells won't be supplied with nutrients and its other needs.

So, the emergence of **systems** is to meet the need for supplying the cells with the nutrients it needs.

NOTES→ At the beginning the zygote divides into two cells, four cells, eight cells…etc.
→ The zygote implanted in the internal tissues of the ***uterus***.
→ ***Ameba*** is a unicellular organism that do the all functions that human cells do (respiration, digestion, absorption) but human cells divide for more than one cell (multicellular).

Don't forget -dear doctor- this sequence **(the levels of structural organization):**

The system level: A **system** consists of related organs with a common function.

- Some channels start to appear in order to deliver the nutrients and expel biproducts (wastes) for some internal cells in a tissue and we call it (**the vascular system).**
- **The vascular system** is made up of vessels (channels) and these channels are connected to almost cells.
- In order for the vascular system to reach all the cells (up and down) we need a pump which is the **heart**, so now the heart is found and we have a system called **(cardiovascular system).**
- The cardiovascular system is one of the first systems to develop in the human being.
- After about 4 weeks of pregnancy we can check the heart beat of embryo.

Note: the *cardiovascular system* includes (blood vessels +the heart), if we add the blood then it is called the *circulatory system*

●**Now the question is how can I take in gases and expel other gases such as CO2 which is a biproduct of metabolism?** ➡ Now, another system has been developed which is the **RESPIRATORY SYSTEM.**

●**Until now we are able to get rid of gases, what about the biproducts of fluid metabolism?** ➡ Another system has emerged which is the **URINARY SYSTEM.**

●**Beside fluids, human being also needs to eat and expel solids** ➡ so, we have a **DIGESTIVE SYSTEM. (Gastrointestinal system)**

● **When organism is born then it needs to move around in order to get food** ➡ we have the **MUSCULOSKELETAL SYSTEM (muscles and bones).**

●**Human being needs protection for the human body from the external dangers** ➡ We have the **INTEGUMENTARY SYSTEM**. (skin, hair, nails)

●Then we need to protect the organism from bacteria and viruses ➡ **IMMUNE SYSTEM**.

●**All the systems and their functions should be controlled so that their functions don't go beyond the expected** ➡ **ENDOCRINE SYSTEM.**

➡ **NERVOUS SYSTEM.**

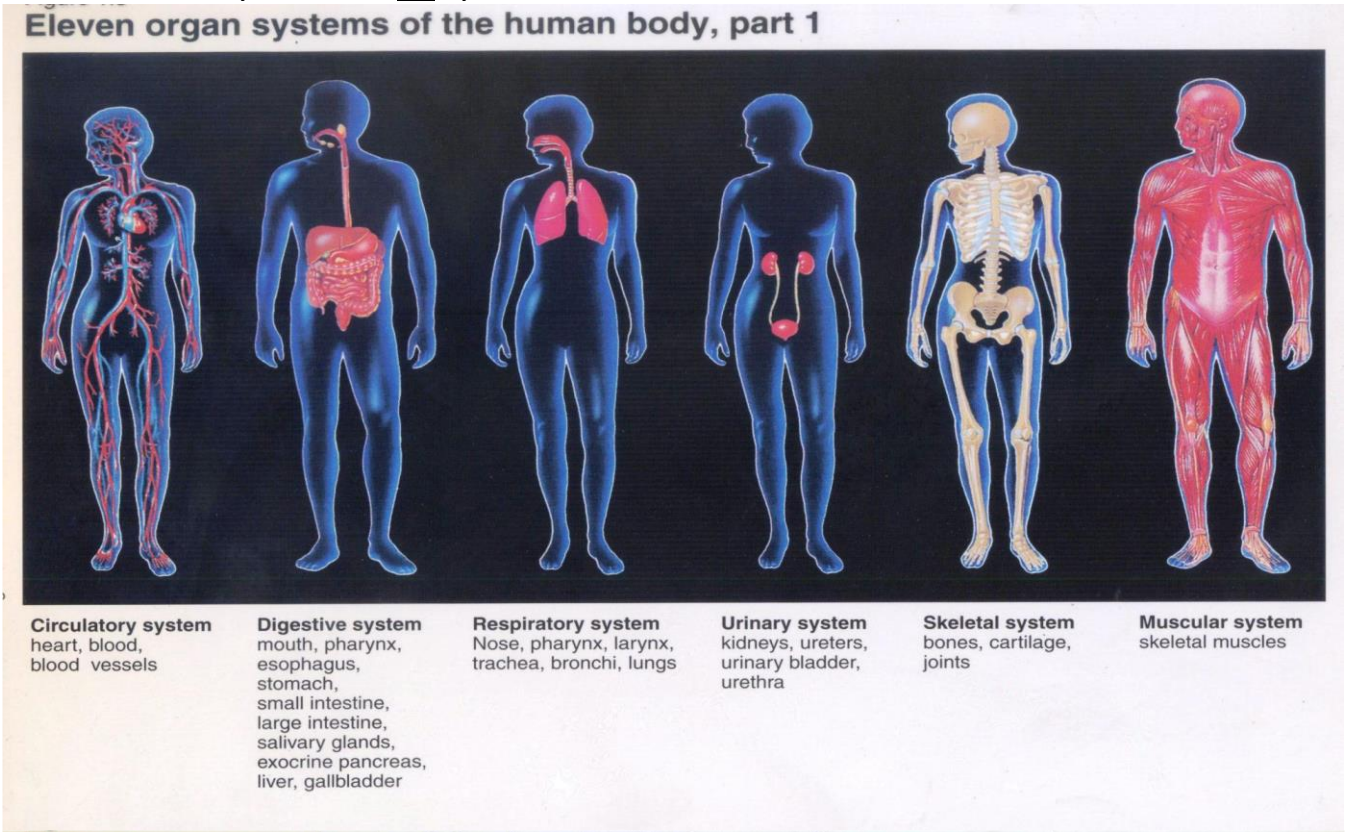
♦***Control system*** is made up of:
Endocrine system.
Nervous system.

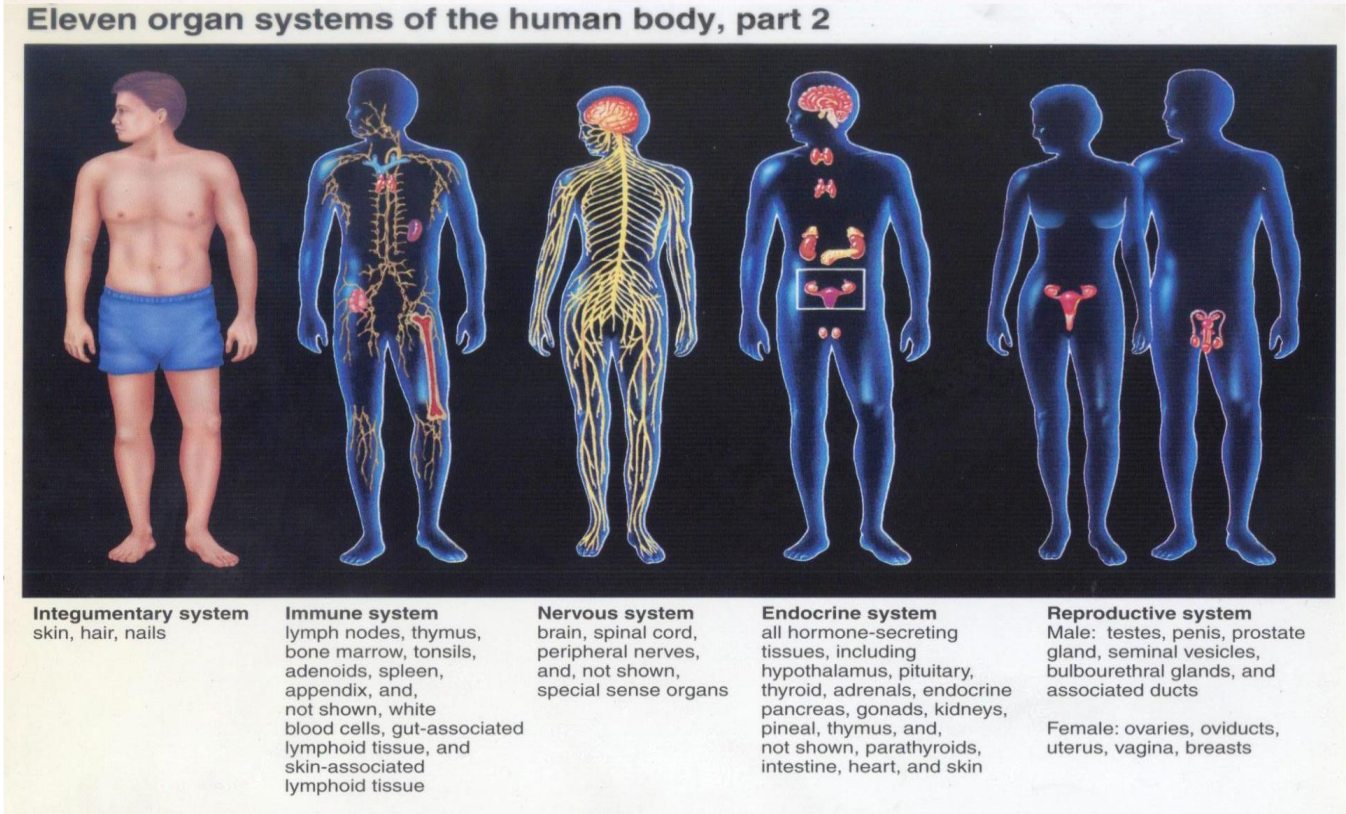
♦**Organ-system level** (for example):

●Digestive system breaks down and absorbs food. (*function*)

●It includes organs such as the mouth, small and large intestines, liver, gallbladder, and pancreas. (structure)

◙In human body we have ***11*** systems, and each has certain functions.





●Endocrine System & Nervous System regulate the function of other systems to keep it almost constant (***Homeostasis***).

● ***Homeostasis***: A condition of **dynamic equilibrium**(balance) in the body's internal environment. Maintain an almost constant internal environment. (Narrow range is compatible with maintaining life).

●NOTE: Each one of the components of the control system (Endocrine System & Nervous System) have different functions than each other and each one work in the same time but on different levels.

●Examples of the variables in our body: **Blood pressure (BP)**, **Blood Glucose Level (BGL)**, **body temperature**, **PH of blood, the concentration of** [CO_2, O_2, Na^+, K^+, Ca^{2+}].

●Example: Blood glucose levels range **between 70 and 110 mg of glucose/dL of blood**.

Note: All the systems in our body work to maintain homeostasis except the reproductive system, it has no homeostatic function and its function is to maintain species.

Homeostasis and Body Fluids

●Maintaining the volume and composition of body fluids are important.

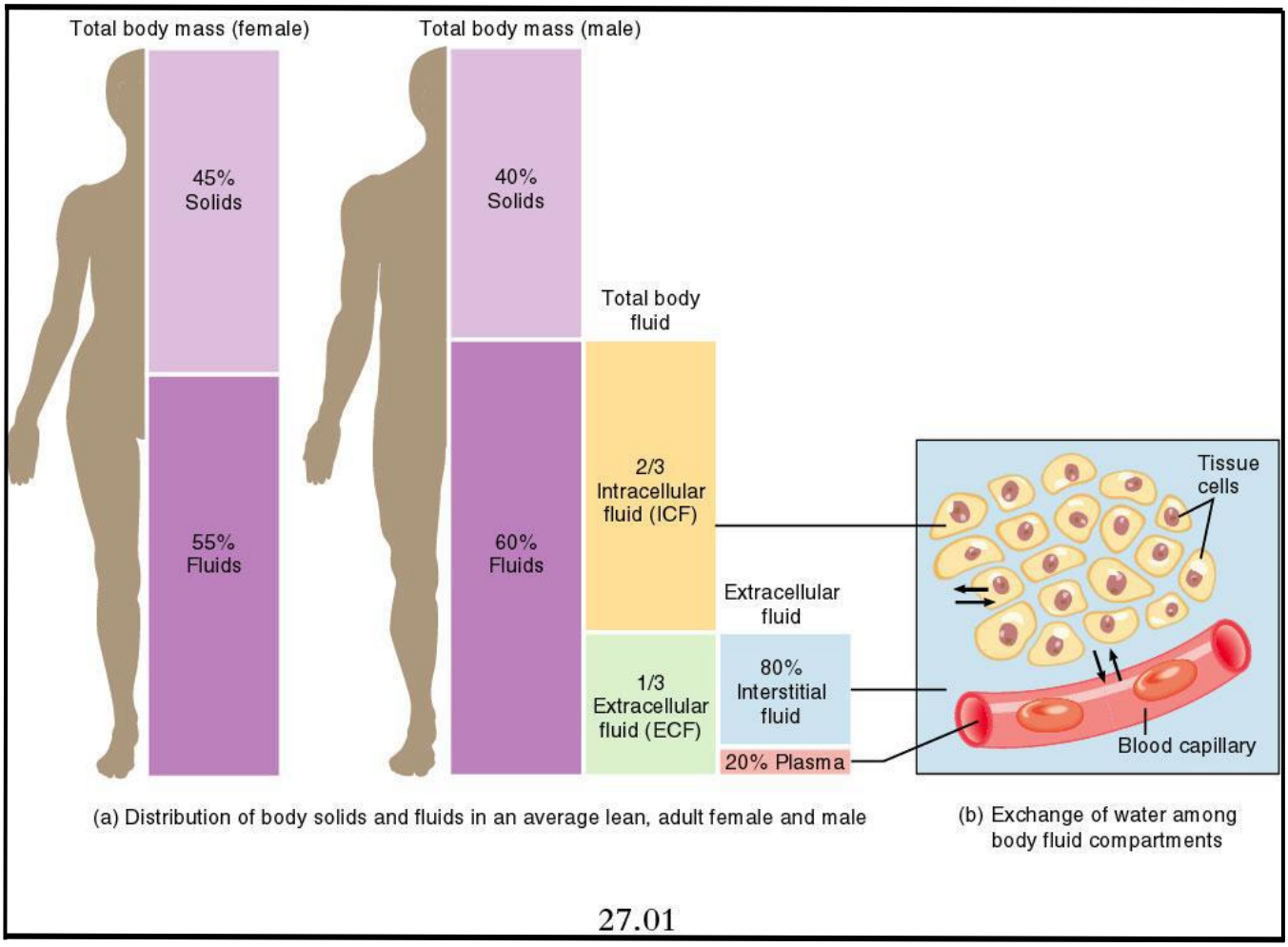
●**Body fluids** are defined as dilute, watery solutions containing dissolved chemicals inside or outside of the cell.

BODY FLUIDS
- Intracellular fluid. (ICF)
- Extracellular fluid. (ECF)
  - Fluid outside cells (Plasma).
  - Interstitial fluid (between cells and tissues).

	Males ♂	Females ♀
Solids	0.40	0.45
Fluids (all fluids in the body)	0.60	0.55
ICF (of the fluids)	⅔	⅔
ECF (of the fluids)	⅓	⅓
Interstitial fluid (of ECF)	0,80	0.80
Plasma (of ECF)	0.20	0.20

●**Example:** suppose we have a **70kg** man, then:
*__fluids__ make 70*0.60 = 42 liters.
__intracellular fluids__ make 42(2/3) = 28 liter (inside the cell).
__extracellular fluids__ make 42(1/3) =14 (3 liters in the __plasma__, 11 liters are __Interstitial fluid__).

●**In females**, they have less percentage of fluids, **why**? Because they have more fat, and fat is hydrophobic (it does not contain fluids or water), and because they have more fat, they have less percentage of fluids. ☺



Interstitial fluid & Body function.

♦Cellular function depends on the regulation of composition of interstitial fluid.

♦***Interstitial fluid*** is our internal environment.

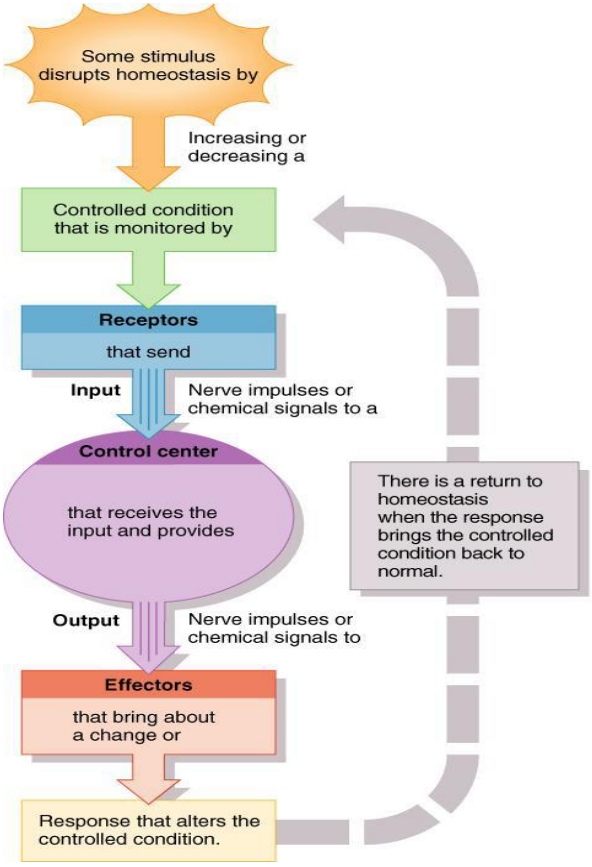
♦Composition of interstitial fluid changes as it moves HOW Movement back and forth across capillary walls provide nutrients (glucose, oxygen, ions) to tissue cells and removes waste (carbon dioxide).

Control of Homeostasis

●Homeostasis is constantly being <u>disrupted</u>:
1.physical insults: intense heat or lack of oxygen.
2.changes in the internal environment: drop of blood glucose due to lack of food.
3.physiological stress: demands or work or school.
●Disruptions might be:
1-mild and temporary (balance is quickly restored).
2-intense and prolonged (poisoning or severe infections).

<u>Feedback System</u>

●Cycle of events.
●Body is monitored and re-monitored.
●Each monitored variable is termed a controlled condition.



◘Three basic components
1- <u>Receptor</u>:
♠ Body structure that monitors changes in a controlled condition.
♠Sends **input** to the control center.
♠Example: Nerve ending of the skin is response to temperature change.

2-<u>Control center</u>:
♠Brain.
♠Sets the range of values to be maintained.
♠Evaluates input received from receptors and generates **output** command: nerve impulses hormones.
♠Example (continued to the example in the first point): Brain acts as a control center receiving nerve impulses from skin temperature receptors.

3-<u>Effector</u>:
♠Receives output from the control center.
♠Produces a response or effect that changes the controlled condition.
♠Found in nearly every organ or tissue.
♠Example (continued): Body temperature drops, the brain sends and impulse to the <u>skeletal muscles</u> to contract (Shivering to generate heat).

***Question**: Determine the components of feedback system in regulating the blood PH.
***Response**: The **receptors** are peripheral chemo-receptors in aortic and carotid bodies. Also, central chemo-receptors in medulla oblongata.
The **control central** is inspiratory area in medulla oblongata.
The **effector** is diaphragm which contracts more forcefully and frequently, so CO_2 is exhaled.

To see the figure, go to slide **16.**

Negative & Positive Feedback Systems

Negative Feedback systems

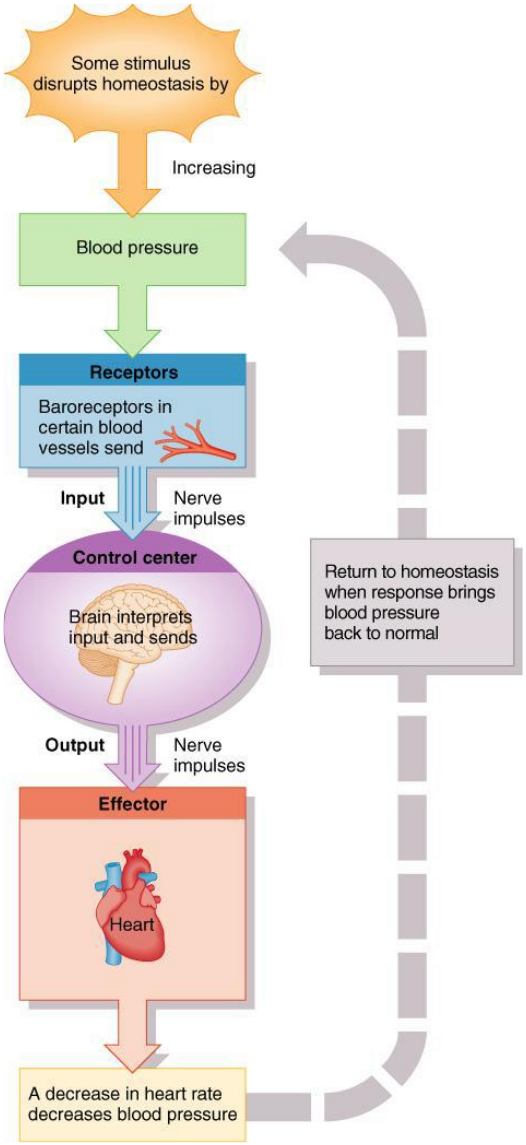
- Reverses a change in a controlled condition. (**opposite direction**)
- Example: **Regulation of blood pressure** (force exerted by blood as it presses again the walls of the blood vessels).

Positive Feedback systems

- Strengthen or reinforce a change in one of the body's controlled conditions. (**same direction**)
- Example: **Normal child birth**.(delivery)

◙ An example of negative feedback: Regulation of blood pressure.

1-External or internal stimulus increase BP.
2-**Baroreceptors** (pressure sensitive receptors) detect higher BP.
3-Send nerve impulses to brain for interpretation.
3-Response -sent via nerve impulse- sent to heart and blood vessels (expand the vessels).
4-BP drops and homeostasis is restored.
5-Drop in BP negates the original stimulus.



NOTES:

- Negative feedback in most cases is normal and compatible with life, while positive feedback in most cases is abnormal and incompatible with life.
- Normal blood sugar level ➔ **Normoglycemia**.
- Increasing in blood sugar level ➔ **Hyperglycemia**.
- Decreasing in blood sugar level ➔ **Hypoglycemia**.

THE END