



# PHYSIOLOGY

FACULTY OF PHARMACEUTICAL SCIENCES

DR. AMJAAD ZUHIER ALROSAN

**LECTURE 1-PART 1 : FUNCTIONAL ORGANIZATION OF THE HUMAN BODY  
AND CONTROL OF THE “INTERNAL ENVIRONMENT”**

# Objectives

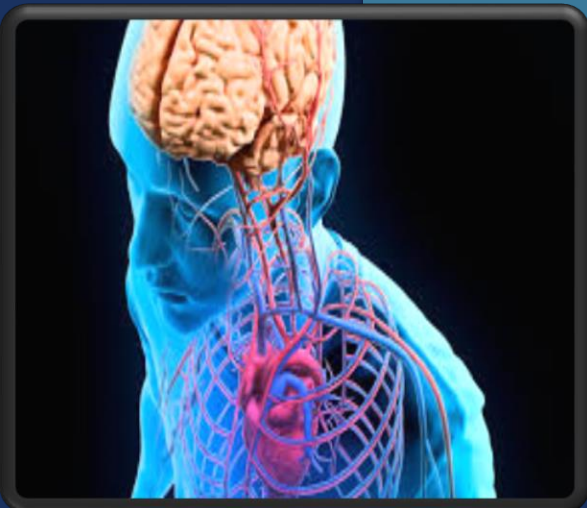
1. Discuss **organization levels of human body.** (Pages 2-5 of the reference).
2. Describe **characteristics of the living human organism.** (Pages 5-8 of the reference).
3. Explore **homeostasis in the human body, including feedback systems and homeostatic imbalances.** (Pages 8-12 of the reference).

# General Overview

Branches of science are:

- 1- Anatomy (structures of body parts)
- 2- Physiology (functions of these parts)

Anatomy



Physiology



# Physiology

دراسة الوظائف على مستوى الخلية وهي أصغر جزء في جسم الإنسان

**1- Cellular Physiology:** Biochemical and biophysical

processes occurs within cells.

**2- Systemic Physiology:** The regulation of physiological

processes within the body.

---

# Pathophysiology

- ❑ The study of disordered body function (i.e., disease).
- ❑ The basis for clinical medicine.

# Pharmacology

- ❑ The study of the effect of drugs on body processes.



# ORGANIZATION LEVELS OF HUMAN BODY

1- **Chemical level** (atoms that form molecules).

ذرات المواد الكيميائية تكوّن جزيئات

2- **Cellular level** (cells: muscle, nerve and epithelial cells). Cells: the basic structural and functional unit (~100 trillion).  
مجموعة الجزيئات تكوّن خلايا

3- **Tissue level** (tissues: epithelial, connective, muscular and nervous tissues).

مجموعة الخلايا تكوّن أنسجة

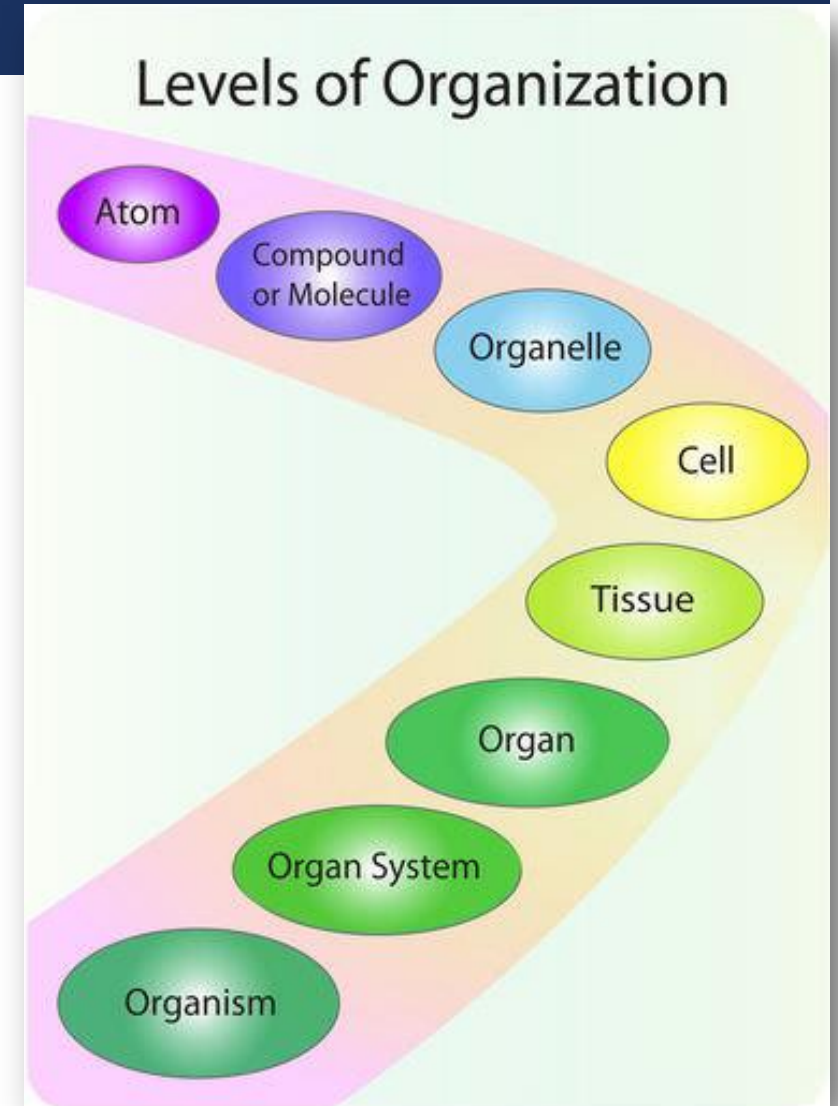
4- **Organ level** (organs: stomach, skin, bones, heart, liver, lungs and brain).

مجموعة الأنسجة تكوّن أعضاء

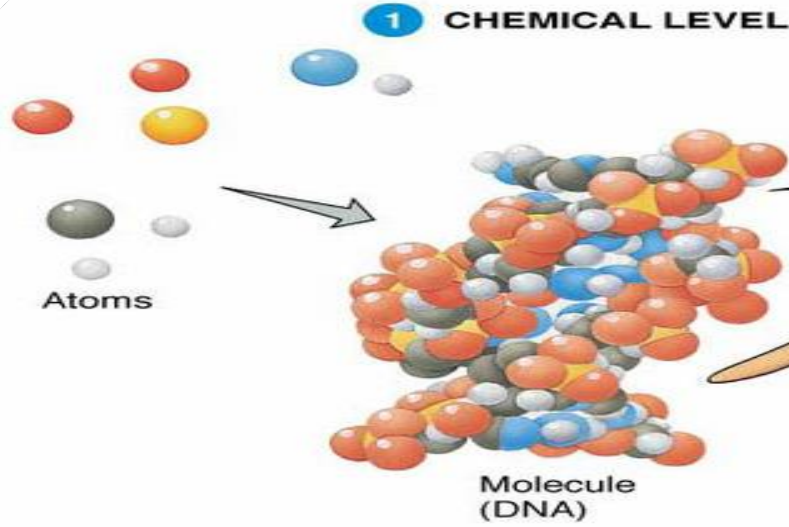
5- **System level** (systems: cardiovascular, urinary).

مجموعة الأعضاء تكوّن أجهزة

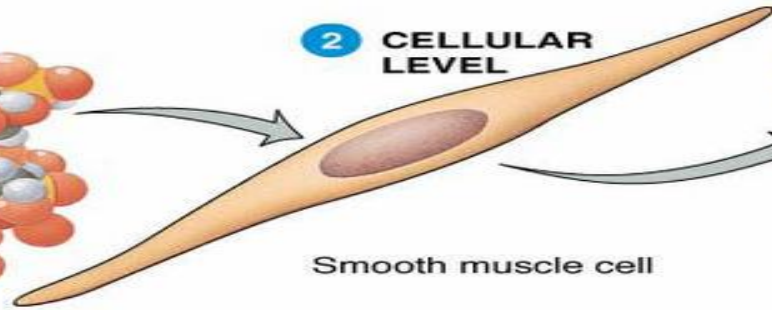
6- **Organismal level**. مجموعة الأجهزة تكوّن الكائن الحي



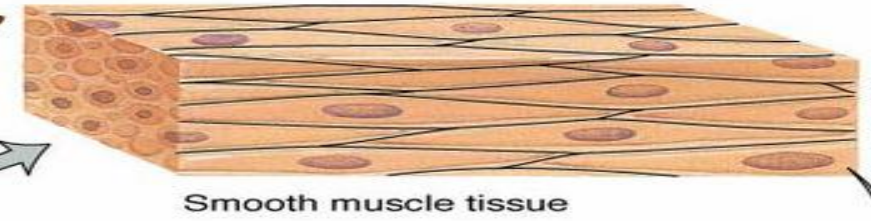
**1 CHEMICAL LEVEL**



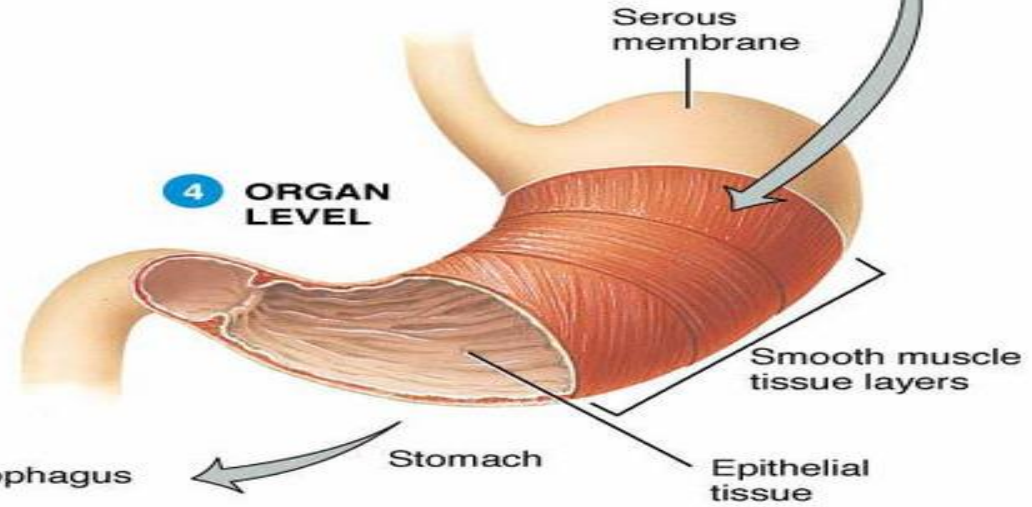
**2 CELLULAR LEVEL**



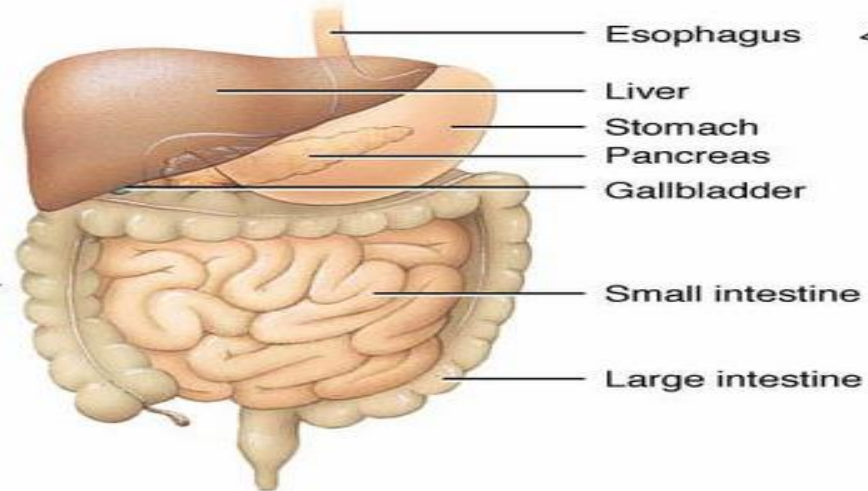
**3 TISSUE LEVEL**



**4 ORGAN LEVEL**



**5 SYSTEM LEVEL**

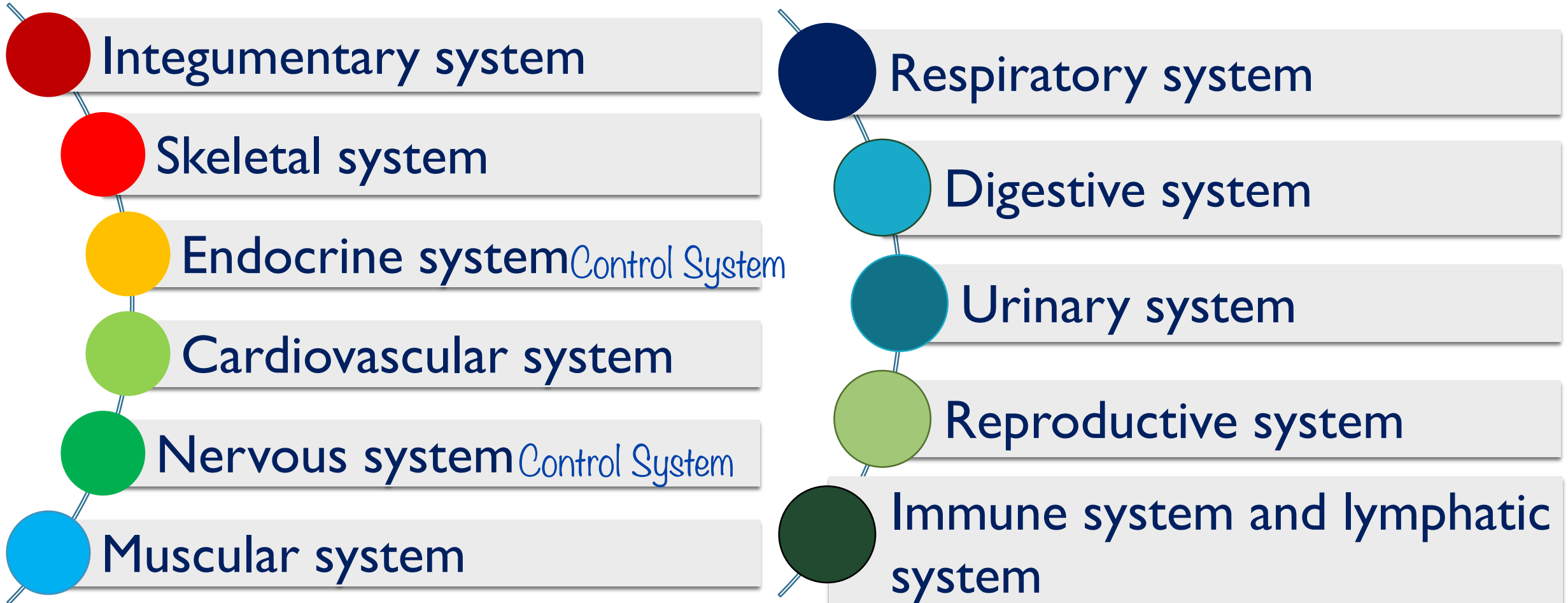


Digestive system

**6 ORGANISMAL LEVEL**



# SYSTEMS OF THE HUMAN BODY



الأجهزة الرئيسية المتحكم بالجسم: Control Systems

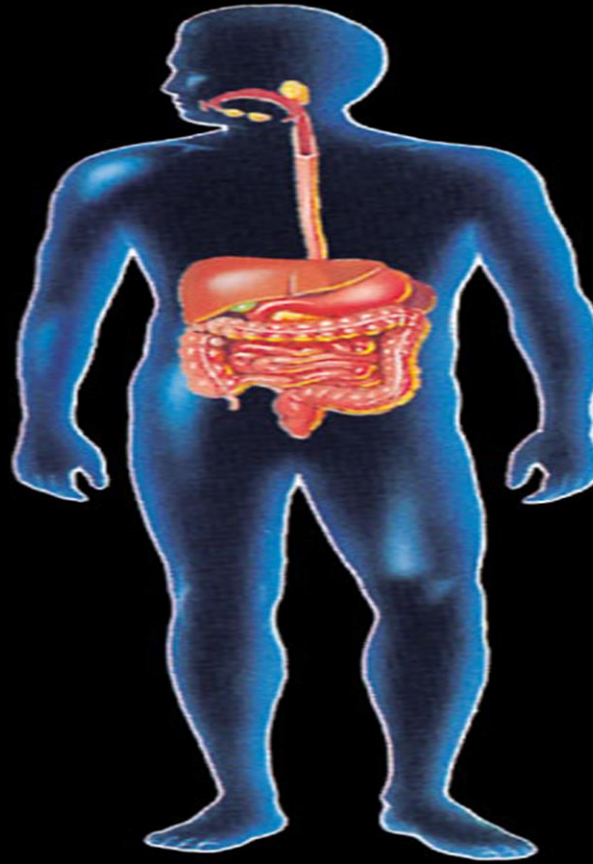




### **Circulatory system**

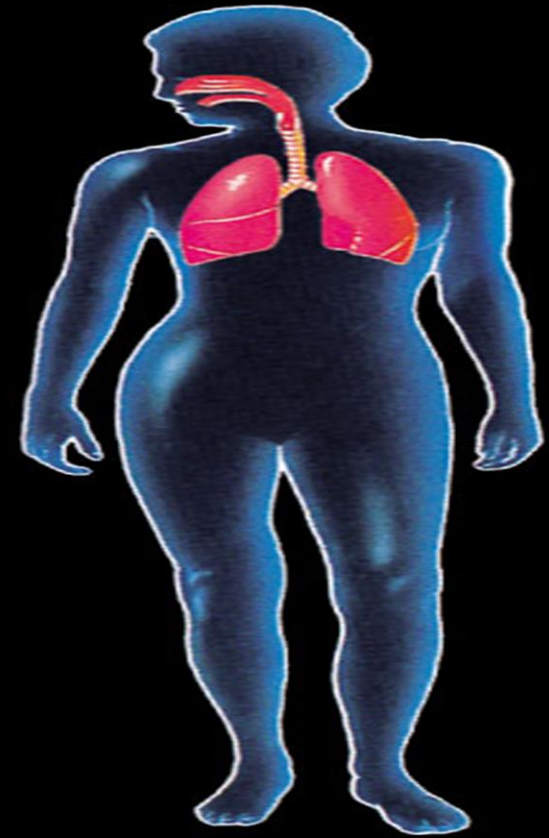
heart, blood,  
blood vessels

Cardiovascular System



### **Digestive system**

mouth, pharynx, esophagus, stomach,  
small intestine, large intestine, salivary  
glands, exocrine pancreas, liver,  
gallbladder



### **Respiratory system**

Nose, pharynx, larynx,  
trachea, bronchi, lungs



### **Urinary system**

kidneys, ureters,  
urinary bladder,  
urethra



### **Skeletal system**

bones, cartilage,  
joints



### **Muscular system**

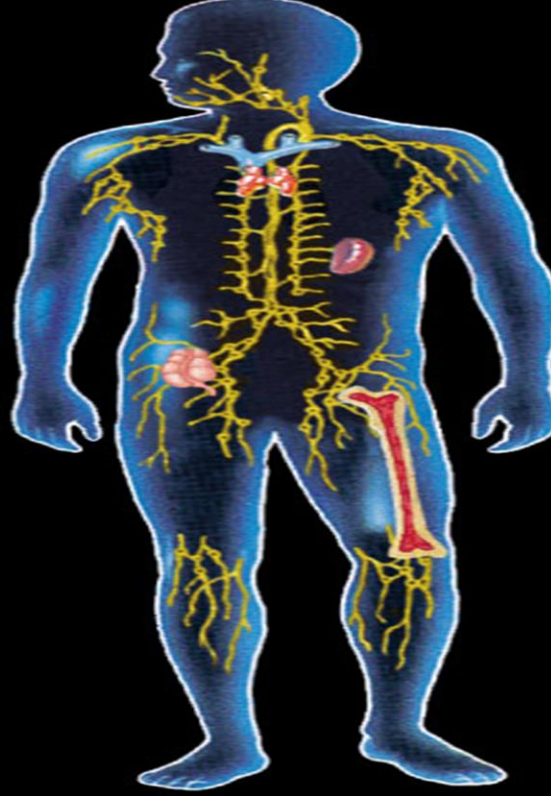
skeletal muscles





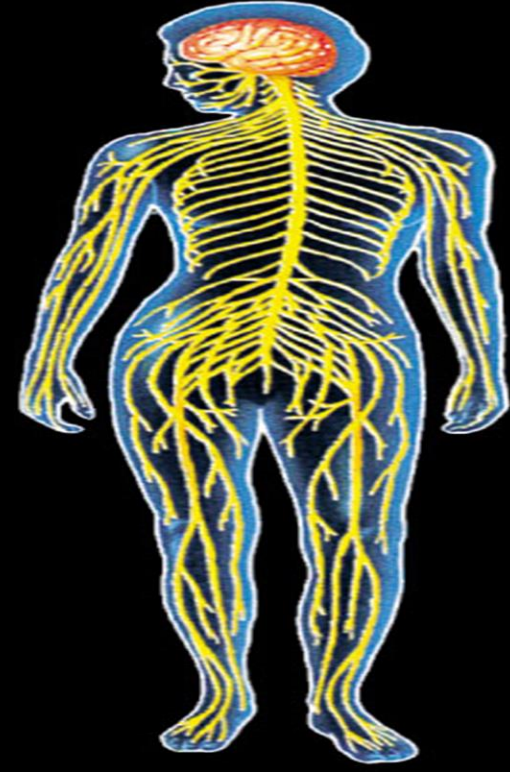
### **Integumentary system**

skin, hair, nails



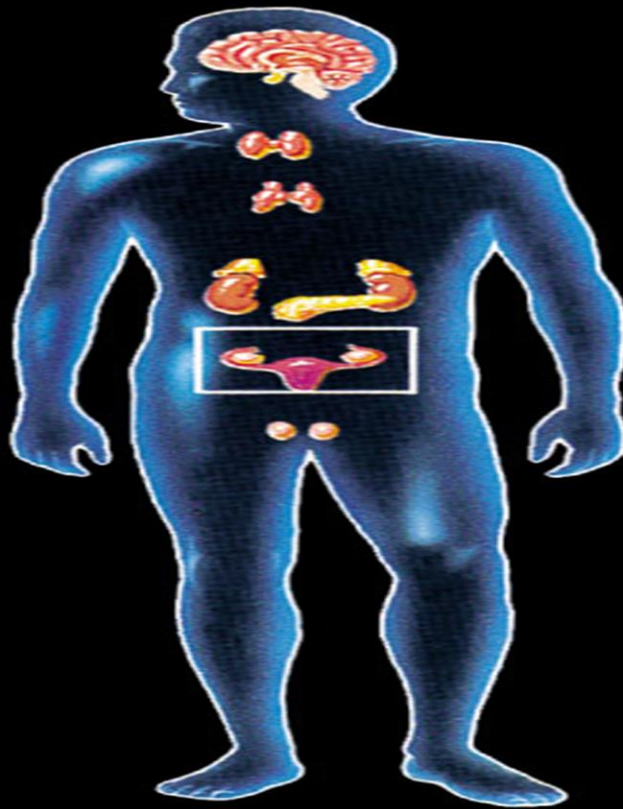
### **Immune system**

lymph nodes, thymus, bone marrow, tonsils, adenoids, spleen, appendix, and, not shown, white blood cells, gut-associated lymphoid tissue, and skin-associated lymphoid tissue



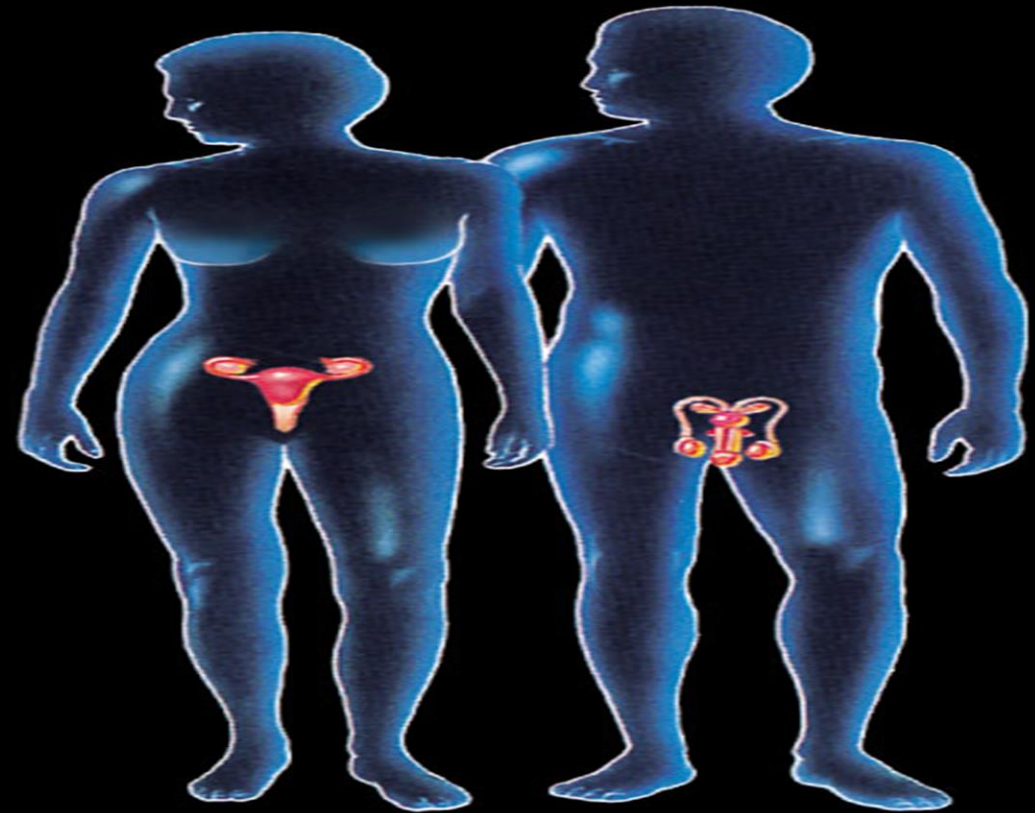
### **Nervous system**

brain, spinal cord, peripheral nerves, and, not shown, special sense organs



### **Endocrine system**

all hormone-secreting tissues, including hypothalamus, pituitary, thyroid, adrenals, endocrine, pancreas, gonads, kidneys, pineal, thymus, and, not shown, parathyroids, intestine, heart, and skin



### **Reproductive system**

Male: testes, penis, prostate gland, seminal vesicles, bulbourethral glands, and associated ducts

Female: ovaries, oviducts, uterus, vagina, breasts

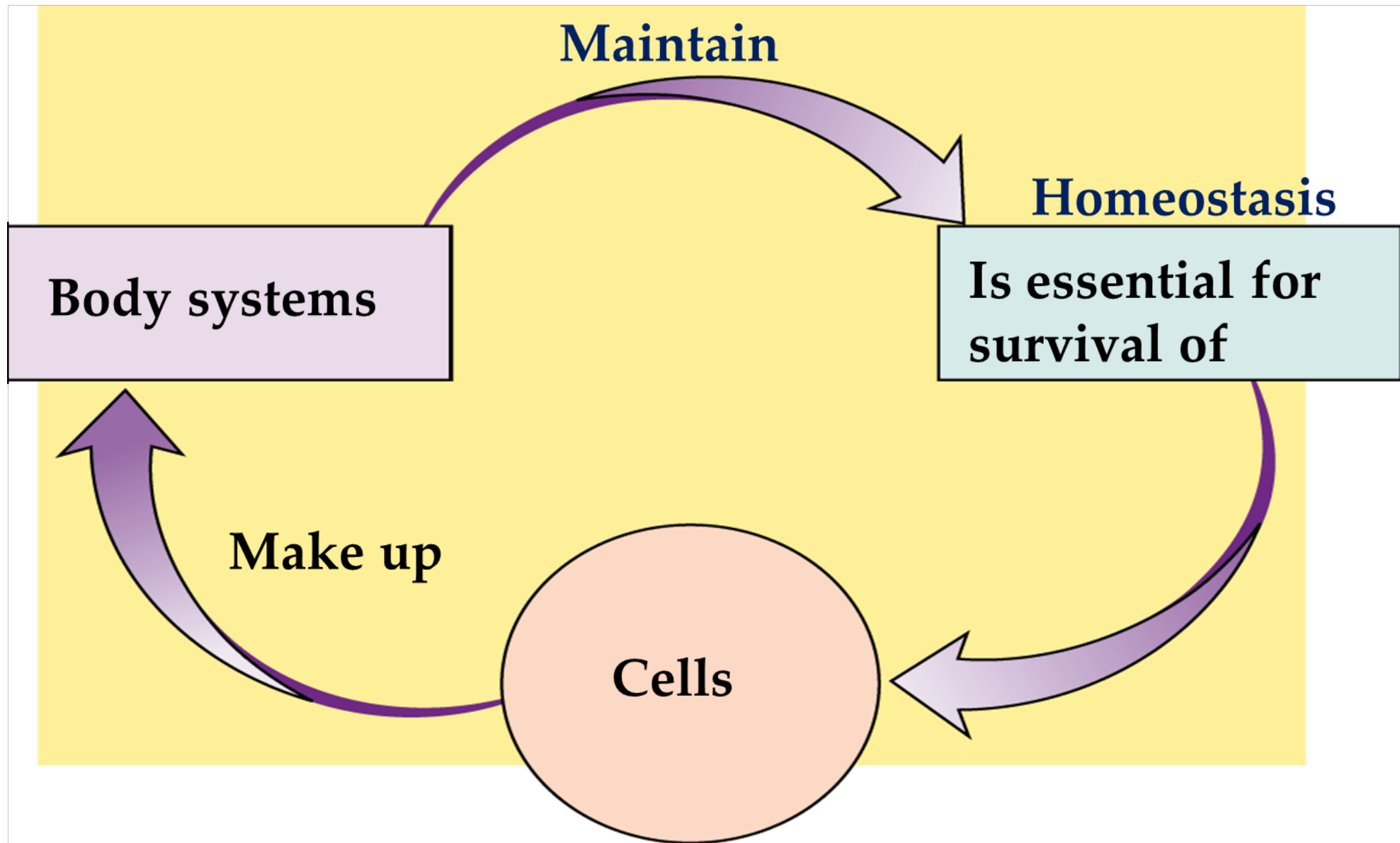
---

# Human physiology

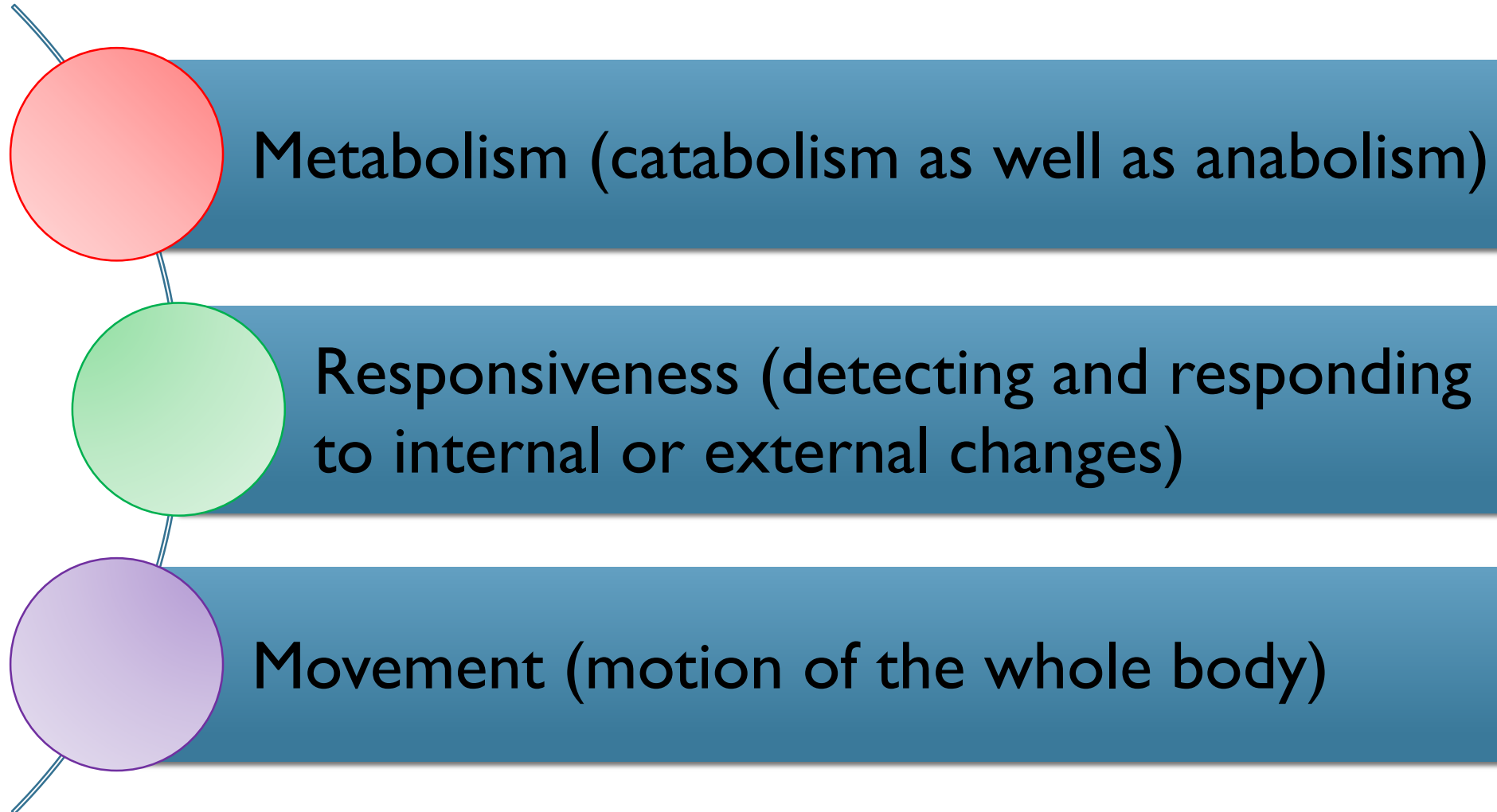
Specific characteristic and mechanisms of the human body that make it a living being. All organs and tissues perform functions that help to maintain internal environment constant (Homeostasis).

↳ Balanced

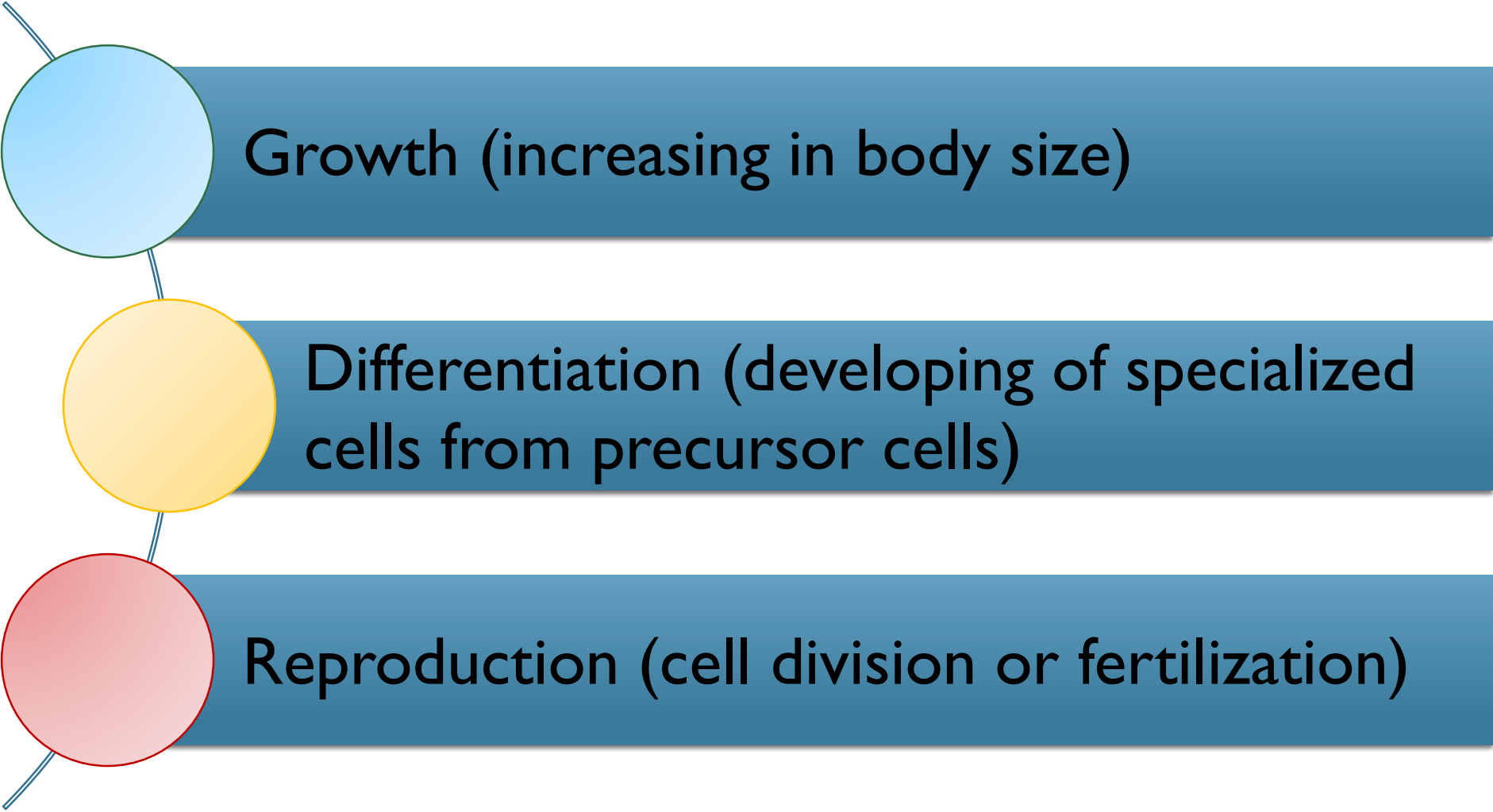




# CHARACTERISTICS OF THE LIVING HUMAN ORGANISM (LIFE PROCESSES)



# CHARACTERISTICS OF THE LIVING HUMAN ORGANISM (LIFE PROCESSES)



Growth (increasing in body size)

Differentiation (developing of specialized cells from precursor cells)

Reproduction (cell division or fertilization)

# HOMEOSTASIS

**Homeostasis** is an equilibrium (balance) in the body's internal environment. ضمان اتزان بيئة جسم الانسان الداخلية

## Homeostasis and body fluids:

- Maintaining the volume and composition of body fluids.
- The fluid within cells is intracellular fluid (ICF).
- The fluid outside body cells is extracellular fluid (ECF).



# HOMEOSTASIS AND BODY FLUIDS

➡ Extracellular fluid: السوائل خارج الخلية

- The ECF that fills the narrow spaces between cells of tissues is known as interstitial fluid.

➡ هو سائل لتعبئة الفراغات بين الخلايا المكوّنة للأنسجة

- The composition of interstitial fluid changes within blood capillaries to provide tissue cells with needed materials, such as glucose, oxygen, etc. Moreover, it removes wastes, such as carbon dioxide from interstitial fluid.

تتغير تركيبة السائل داخل الشعيرات الدموية بحيث تزود الخلايا بما تحتاجه من عناصر وتتخلص من المخلفات مثل ثاني أكسيد الكربون

# HOMEOSTASIS

**Homeostasis in the human body is continually being disturbed,**

- From the external environment, the internal environment and psychological stresses.

قد يتأثر اتزان الجسم بسبب عدة عوامل خارجية

- Can be temporarily or prolonged. كالتوتر وهذا الخل بالاتزان قد يكون مؤقت أو دائم



كما يحتوي الجسم على أجهزة تنظم عمل الجسم عادة ما تساعد بعودة اتزان الجسم إلى طبيعته

- The body has many regulating systems that can usually return the internal environment back into balance.

# HOMEOSTASIS

- Nervous system regulates homeostasis through sending electrical signals known as **nerve impulses** (action potentials) to organs....

*Rapid change* يبعث الجهاز العصبي رسائل للدماغ على شكل سيالات  
عصبية للأعضاء ويحدث تغيير بشكل سريع

- The endocrine system regulates homeostasis through secreting messenger molecules called **hormones** into the blood..... *Slow change*

يفرز جهاز الغدد الصماء هرمونات للدم ويحدث تغيير بشكل بطيء

- Rapid or slow changes work toward the **negative feedback systems**.

Allows the body to regulate itself ↩

# FEEDBACK SYSTEMS

- The internal environment can be regulated through **feedback system or feedback loop that monitored controlled variables** such as body temperature, blood pressure, or blood glucose level. (**Homeostatic reflex that can be innate “built-in” and learned homeostatic reflex.**)  
↳ بالفطرة  
↳ Eg : controlling yourself when مُكتسب stress
- Changing of a controlled condition is called **stimulus**.
- Basic components of feedback system are a **stimulus, a receptor, a control center, and an effector.**