



PHYSIOLOGY

FACULTY OF PHARMACEUTICAL SCIENCES

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**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

1- **Cellular Physiology:** ^{الفيزياء والكيمياء} Biochemical and ^{الفيزياء والكيمياء} biophysical
^{التي تحدث داخل الخلايا} processes occurs within cells.

2- **Systemic Physiology:** ^{تنظيم الوظائف داخل الجسم} 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).

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

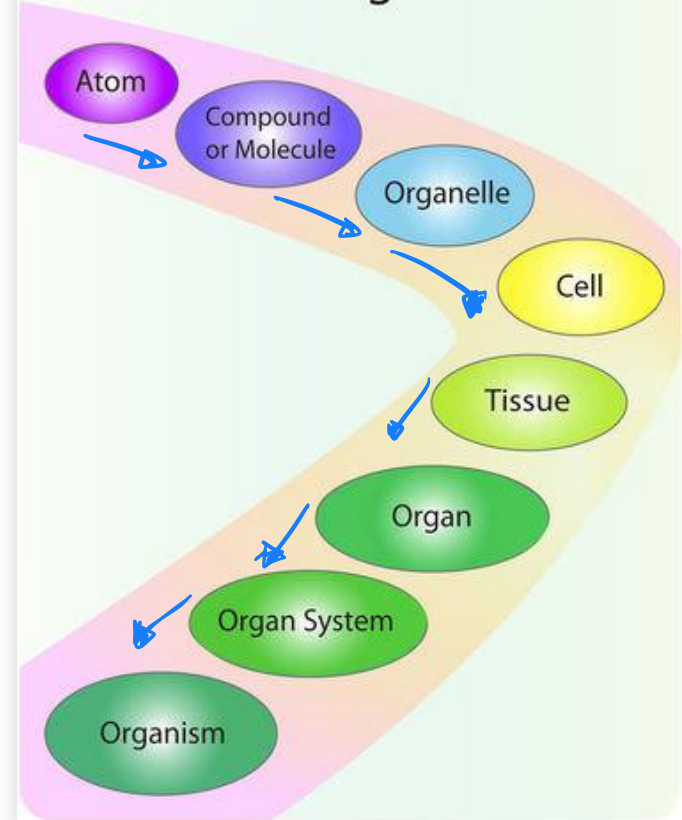
3- **Tissue level** (tissues: epithelial, connective, muscular and nervous tissues).

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

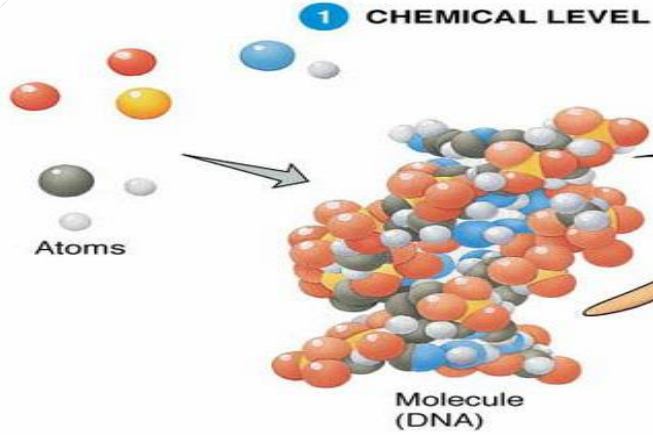
5- **System level** (systems: cardiovascular, urinary).

6- **Organismal level.**

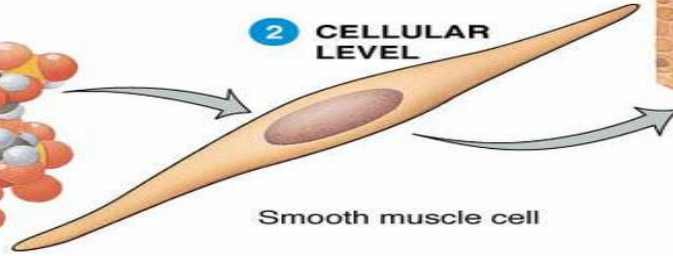
Levels of Organization



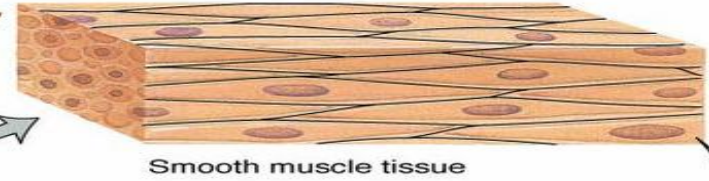
1 CHEMICAL LEVEL



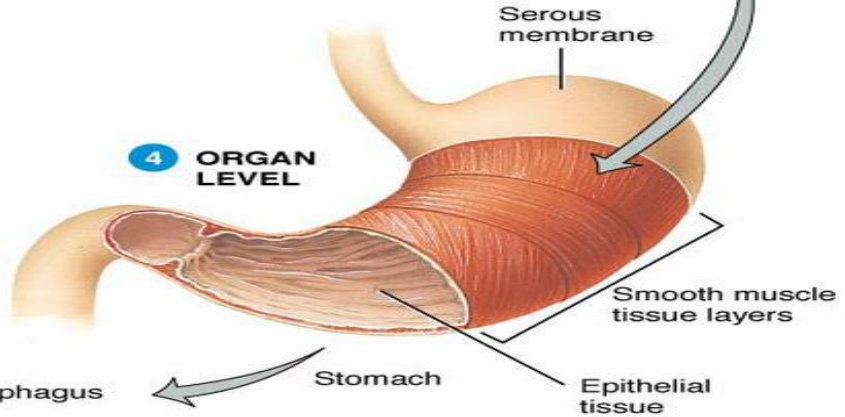
2 CELLULAR LEVEL



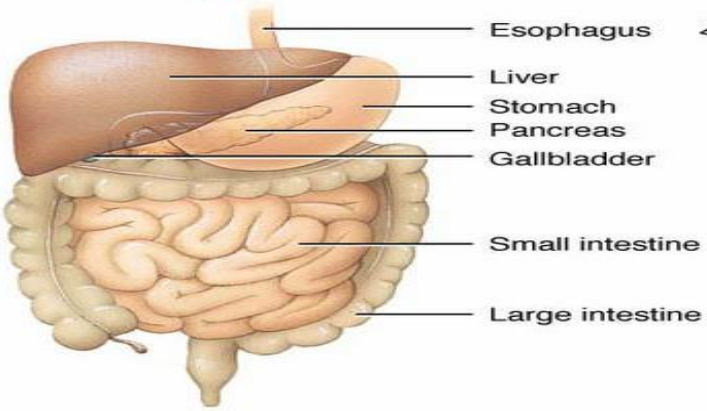
3 TISSUE LEVEL



4 ORGAN LEVEL



5 SYSTEM LEVEL

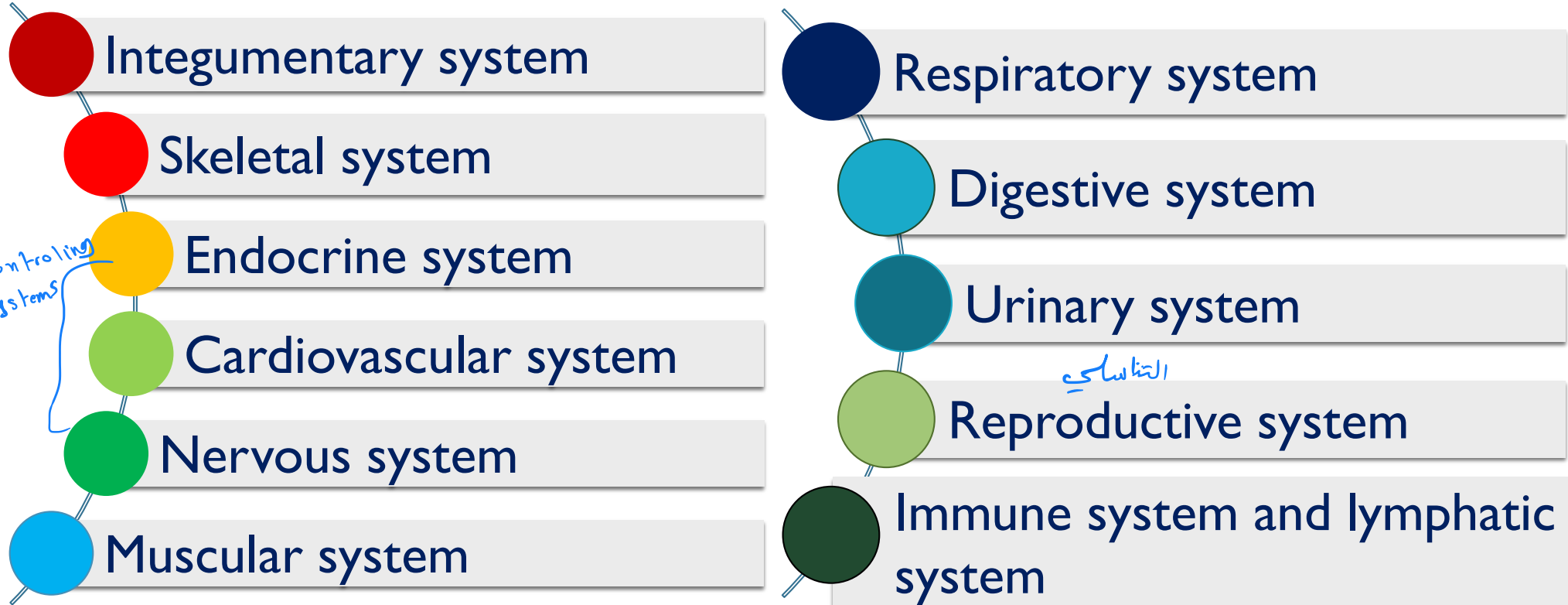


6 ORGANISMAL LEVEL



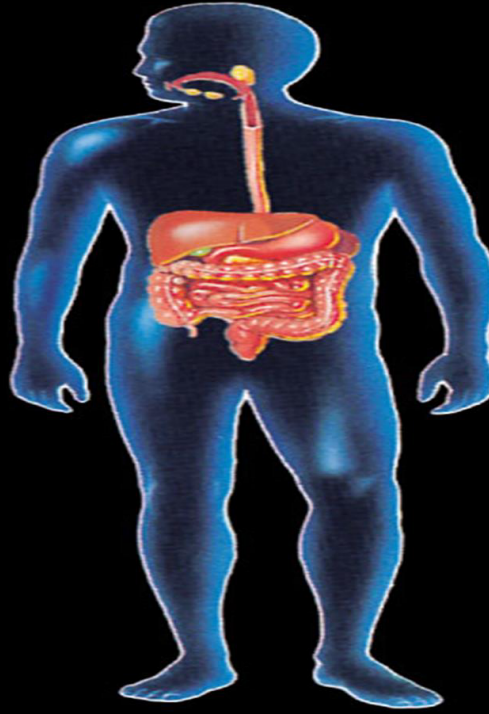
Digestive system

SYSTEMS OF THE HUMAN BODY

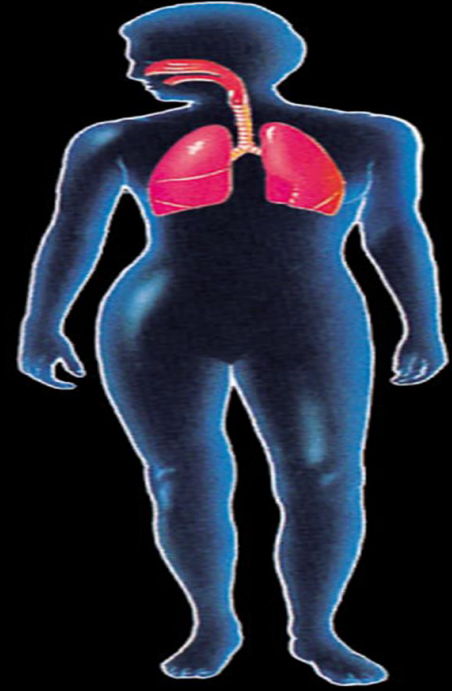




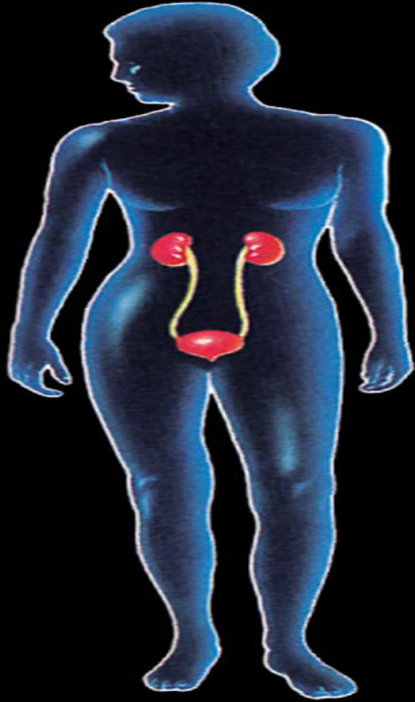
← الدم وراشي
Circulatory system
 heart, blood,
 blood vessels



← هضمي
Digestive system
 mouth, pharynx, esophagus, stomach,
 small intestine, large intestine, salivary
 glands, exocrine pancreas, liver,
 gallbladder



← تنفسي
Respiratory system
 Nose, pharynx, larynx,
 trachea, bronchi, lungs



← ہولی **Urinary system**
kidneys, ureters,
urinary bladder,
urethra



← عظمی **Skeletal system**
bones, cartilage,
joints

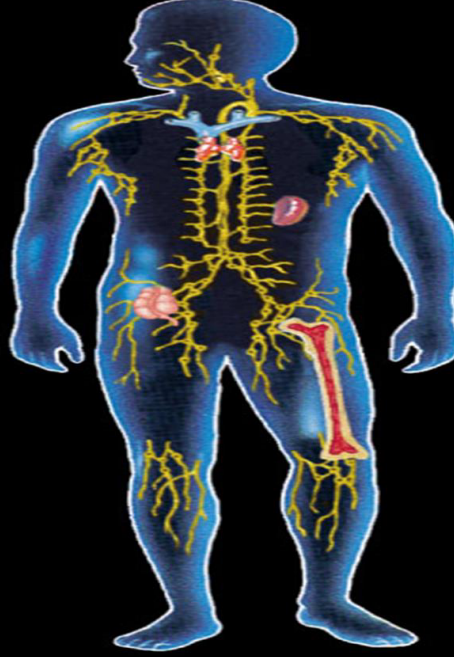


← العضلی **Muscular system**
skeletal muscles



Integumentary system

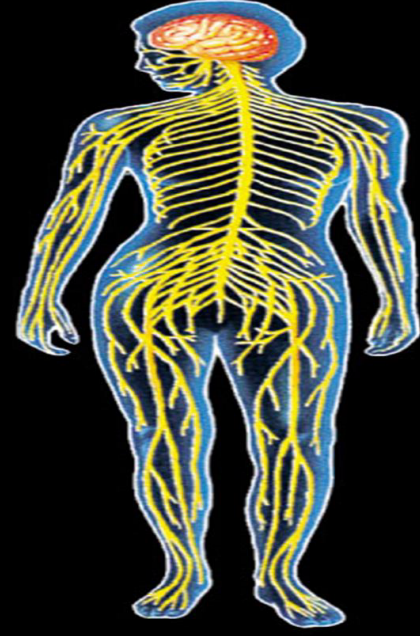
skin, hair, nails



المناعة

Immune system

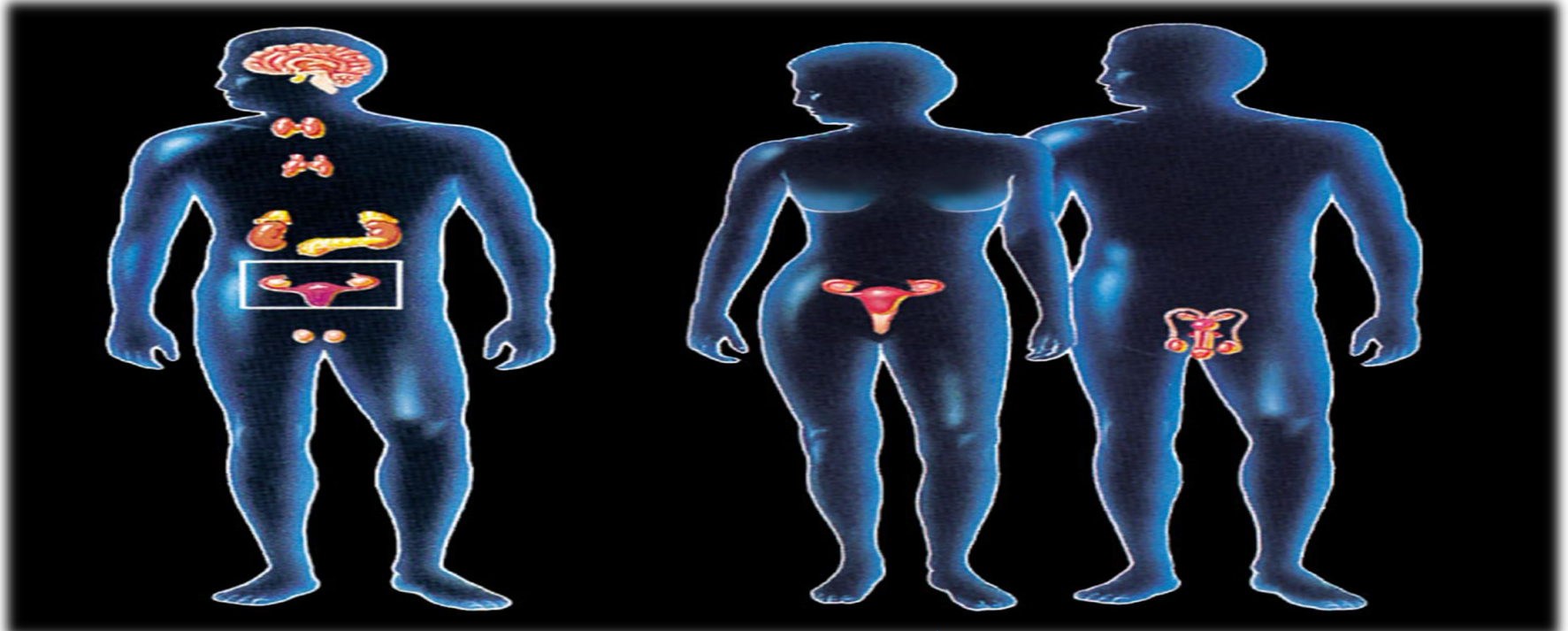
lymph nodes, thymus, bone marrow, tonsils, adenoids, spleen, appendix, and, not shown, white blood cells, gut- associated lymphoid tissue, and skin-associated lymphoid tissue



العصبي

Nervous system

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



← الغدد الصماء

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

النظام التناسلي

Reproductive system

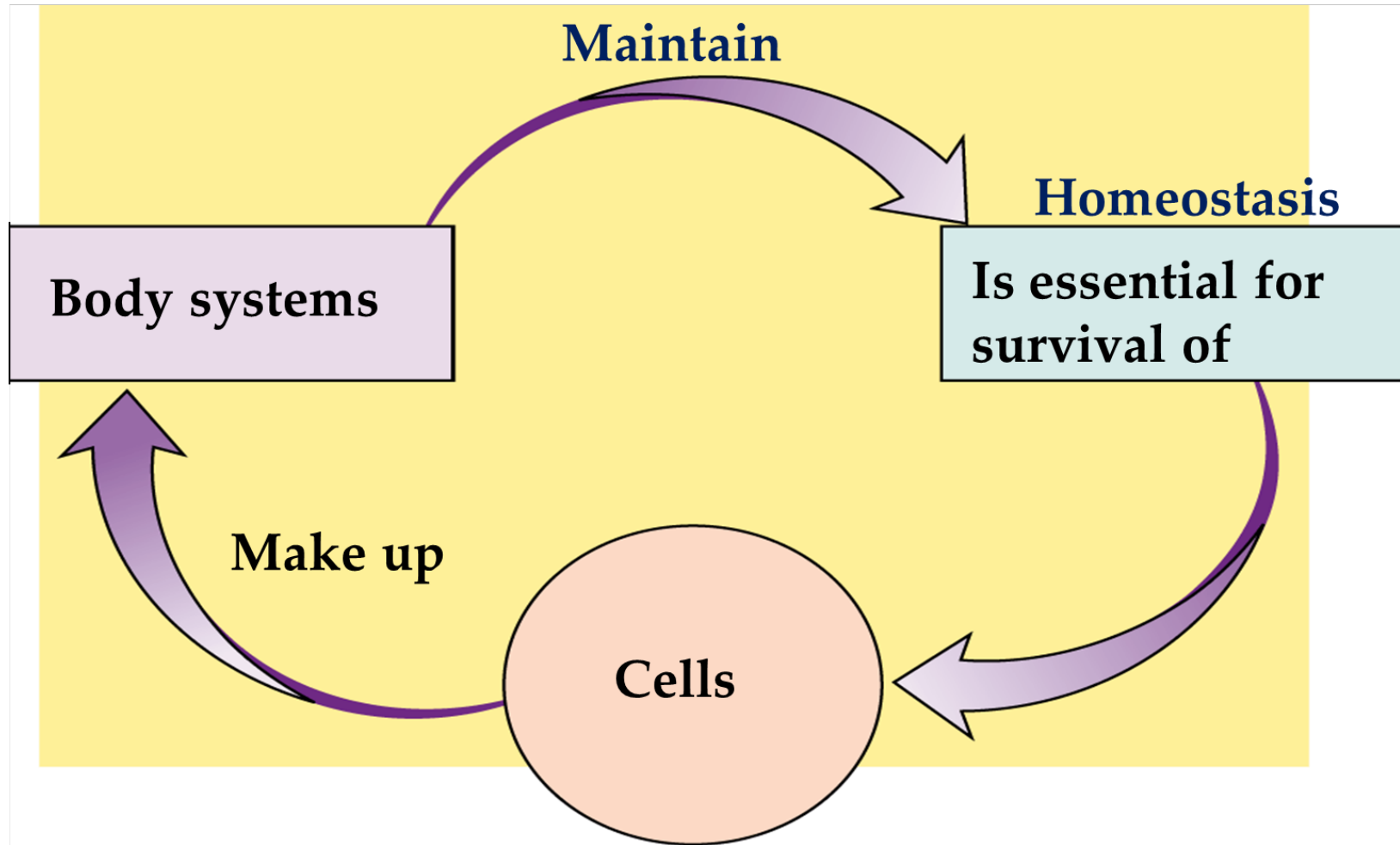
Male: testes, penis, prostate gland, seminal vesicles, bulbourethral glands, and associated ducts

Female: ovaries, oviducts, uterus, vagina, breasts

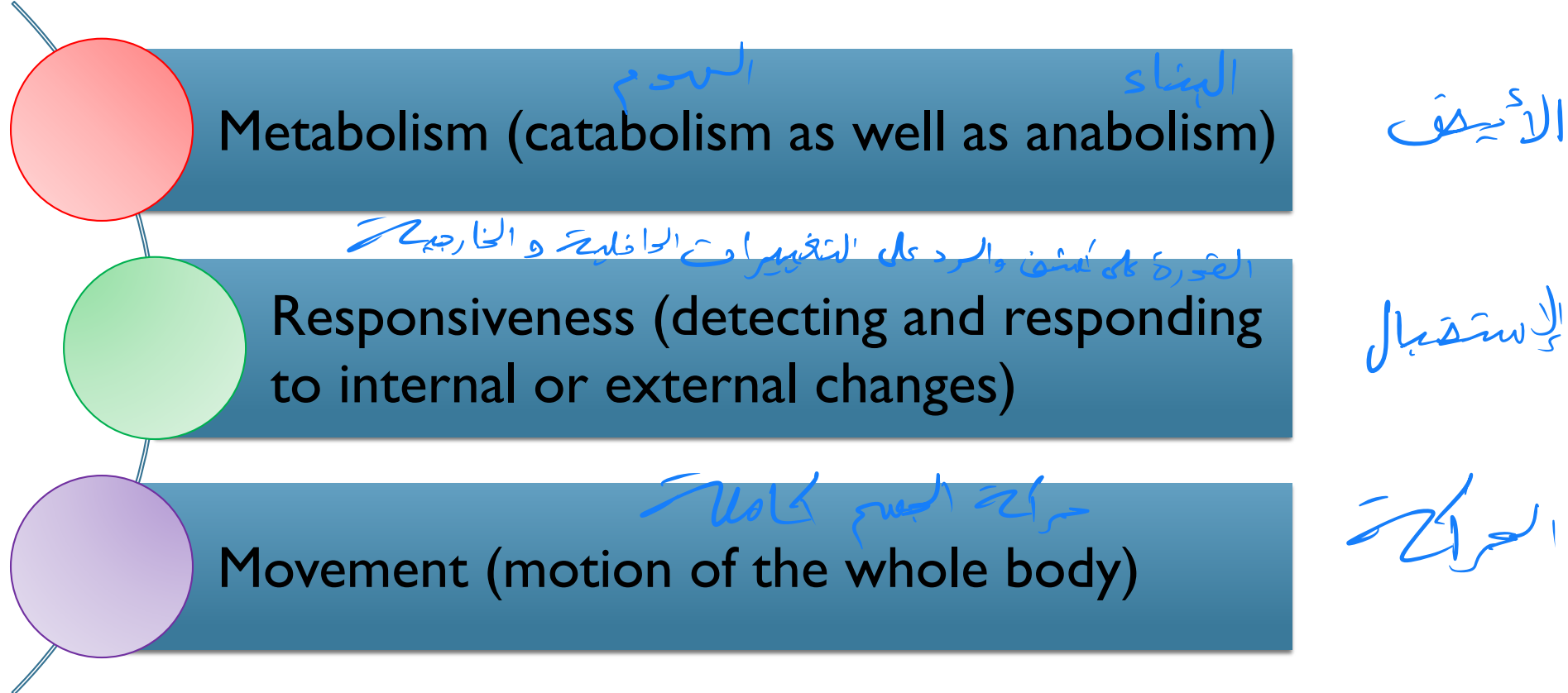
Human physiology

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).

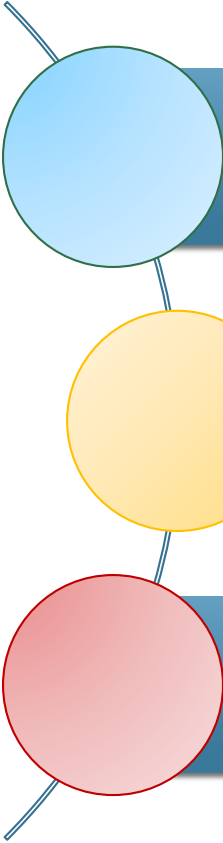
↳ Balanced = *Equilibrium*



CHARACTERISTICS OF THE LIVING HUMAN ORGANISM (LIFE PROCESSES)



CHARACTERISTICS OF THE LIVING HUMAN ORGANISM (LIFE PROCESSES)



Growth (increasing in body size)

النمو

Differentiation (developing of specialized cells from precursor cells)

التمايز

Reproduction (cell division or fertilization)

التكاثر

HOMEOSTASIS

Homeostasis is an equilibrium (balance) in the body's internal environment.

Homeostasis and body fluids:

الحفاظ على حجم وتركيب السوائل بالجسم

- 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



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

بين الخلايا والأنسجة خلال
السائل الخلالي

- 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.

يزود المنطقة بين الخلايا والأنسجة بالمواد اللازمة مثل الجلوكوز والأكسجين + يزيل الفضلات مثل ثاني أكسيد الكربون (CO₂)

HOMEOSTASIS

التوازن متفرب دائما في الجسم
Homeostasis in the human body is continually being disturbed,

- متفرب بسبب البيئة الخارجية والداخلية والتوتر
- From the external environment, the internal environment and psychological stresses.
 - Can be temporarily or prolonged.

- يحتوي الجسم على العديد من الأنظمة التي تنظم البيئة الداخلية وترجعها للتوازن
- 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
تغير سريع
- The endocrine system regulates homeostasis through secreting messenger molecules called **hormones** into the blood..... *Slow change*
جهاز الغدد الصماء
تغير بطيء
- Rapid or slow changes work toward the **negative feedback systems**.

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.**)

يتم تنظيم البيئة الداخلية من خلال نظام التغذية الراجعة (Feedback loop) الذي يراقب المتغيرات المتحكم بها

(Controlled variables) مثل ضغط الدم أو درجة حرارة الجسم.

التي يغير الظروف التي تحدث بالجسم باسم المحفز

- Changing of a controlled condition is called **stimulus**.

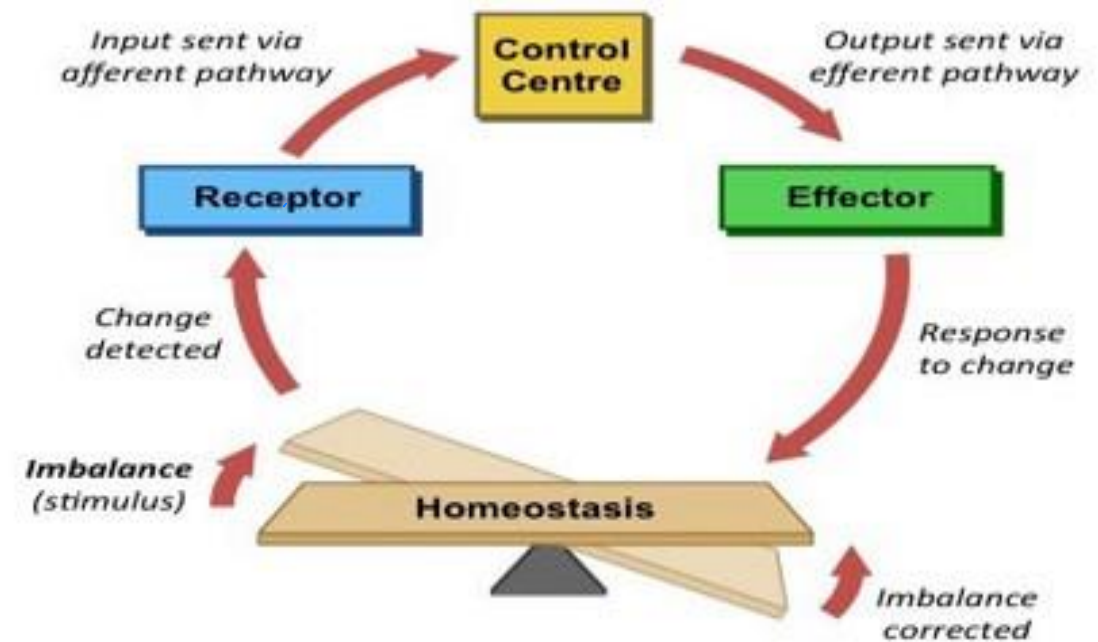
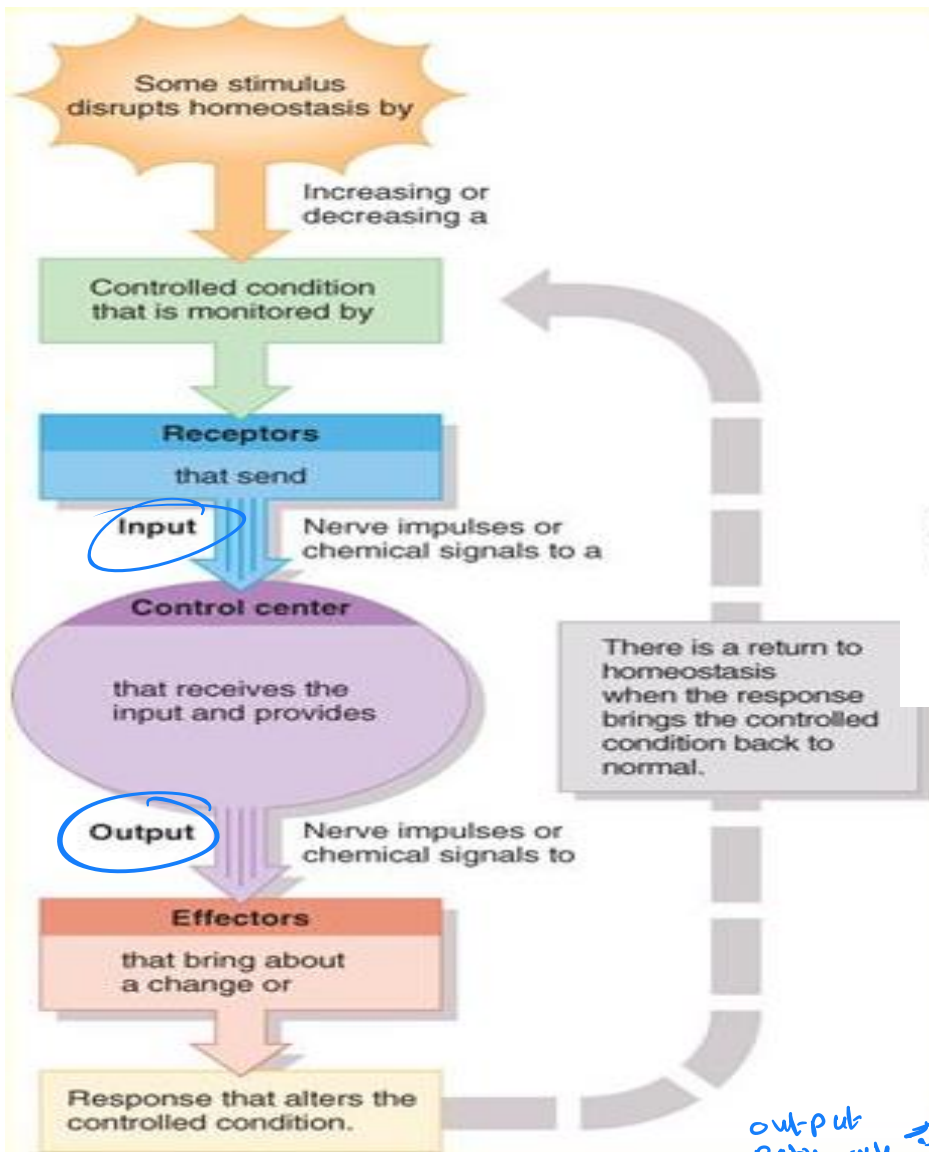
نظام التغذية الراجعة

المحفز الحسّاس

- Basic components of feedback system are a **stimulus, a receptor, a control center, and an effector.**

مركز التحكم

المنفذ



Group of receptors and effectors communicating with their control center forms a feedback system

من المستقبل الى Control center عبر input path way / من Control center الى المنفذ عبر output path way

- The feedback systems can be positive or negative feedback systems.

- A negative feedback system reverses the change in a controlled condition.
عكس التغيير في الظروف المتحكم بها

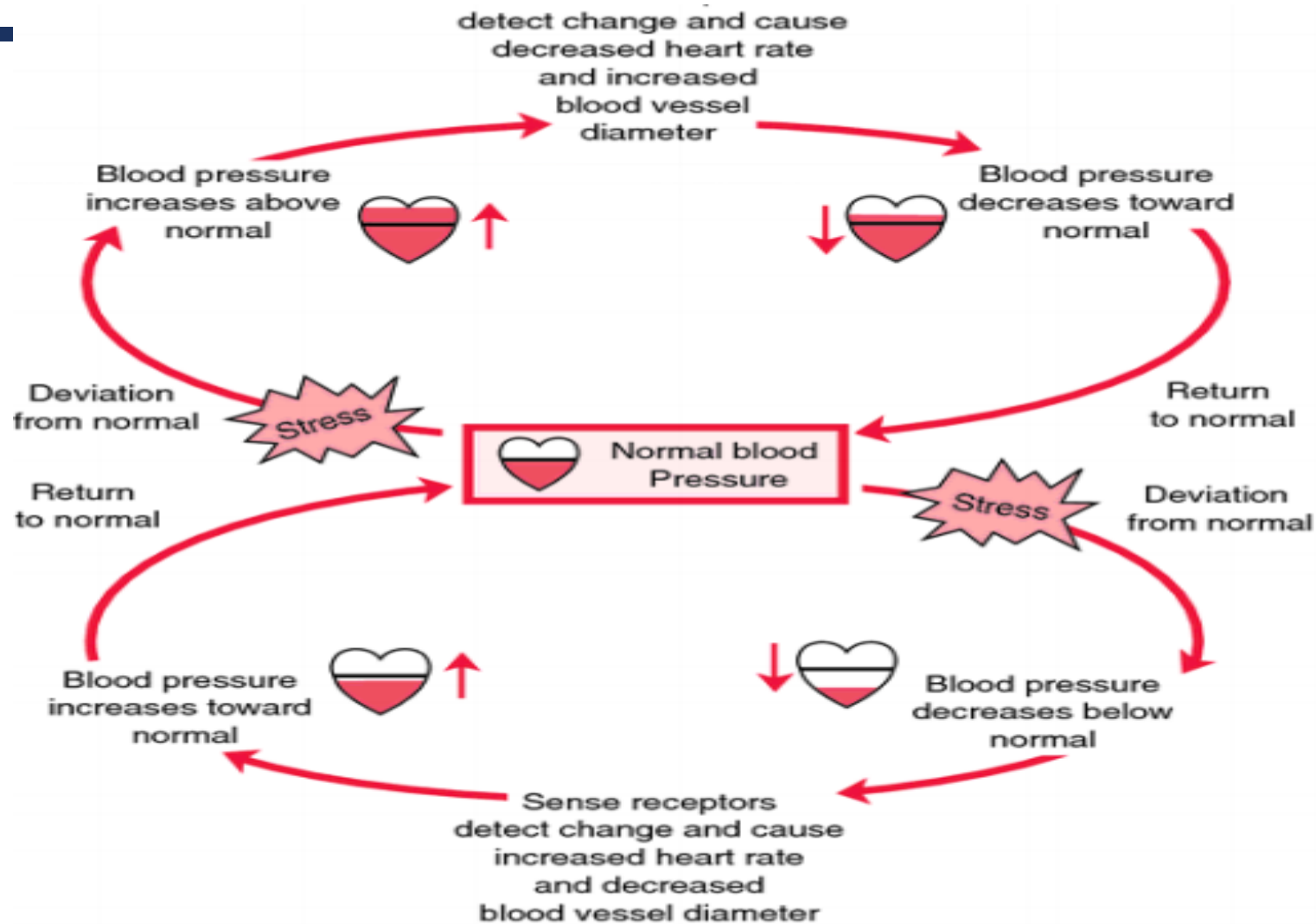
- Dislike a negative feedback system, a positive feedback system tends to strengthen or reinforce a change in one of the body's controlled conditions.

• يعمل على تعزيز أو تقوية التغيير الحاصل.
• إذا استمر عمله، فقد يؤدي إلى حالات تهدد الحياة.

- If the action of a positive feedback system is continued, it may produce life-threatening conditions in the body.

• يعمل على عكس التغيير في الظروف المتحكم بها.
• يتباطأ عمله ثم يتوقف عندما يعود الطرف إلى حالته الطبيعية.
• تعمل الأنظمة العصبية والغدد الصماء عادةً باتجاه أنظمة التغذية الراجعة السلبية.

- Unlike a positive feedback system, the action of a negative feedback system slows and then stops because the controlled condition returns to its normal state.



HOMEOSTATIC IMBALANCES

- **Disease is a more specific term for an illness that is characterized by a recognizable set of signs and symptoms.**
- Local disease affects a specific region of the body.
- Systemic disease affects either the entire body or several parts of it.
- Subjective changes in body functions (**symptoms**) that are not apparent to an observer (i.e. headache, nausea, and anxiety).
- Objective changes that a clinician can observe and measure are called **signs**.

المرض (Disease) هو تعبير أكثر تحديداً عن علة تتميز بمجموعة من العلامات والأعراض المعروفة.

- مرض موضعي (Local disease): يؤثر على منطقة محددة من الجسم.
- مرض جهازى (Systemic disease): يؤثر على الجسم كله أو أجزاء عديدة منه.
- الأعراض (Symptoms): هي تغيرات ذاتية في وظائف الجسم لا تكون واضحة للمُلاحظ، مثل الصداع أو الغثيان.
- العلامات (Signs): هي تغيرات موضوعية يمكن للطبيب ملاحظتها وقياسها، مثل الحمى أو ارتفاع ضغط الدم.



THANK YOU

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