لجان الدُّفعات

PHYSIOLOGY

MORPHINE ACADEMY

مبدأيًا، بحاول ندرس ال normal functions للأعضاء الموجودة بال system.

PHYSIOLOGY

FACULTY OF PHARMACEUTICAL SCIENCES

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<u>LECTURE 1-PART 1</u> : FUNCTIONAL ORGANIZATION OF THE HUMAN BODY AND CONTROL OF THE "INTERNAL ENVIRONMENT"

Organization levels of human body:

Human body ← **systems** > organs > tissues > cells

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3 components of cells:

- Plasma membrane (P.M)
- **cytoplasm**
- nucleus

, nucleus و P.M الي بينفصل بين

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

الـ Anatomy : الكلمة معناها = تشريح/تقطيع/جسم

الـ Physiology : الكلمة معناها : كيف يعمل الجسم؟

مجموعة Definitions برانيه بيكم لمفهوم.

Physiology

1- Cellular Physiology: Biochemical and biophysical processes occurs within cells.

زي نقل الأيونات عبر الخلايا.

2- Systemic Physiology: The regulation of physiological processes within the body.

تنظيم الوظائف

زي كيف بنهضم والجهاز التنفسي بيدي الغازات.

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).

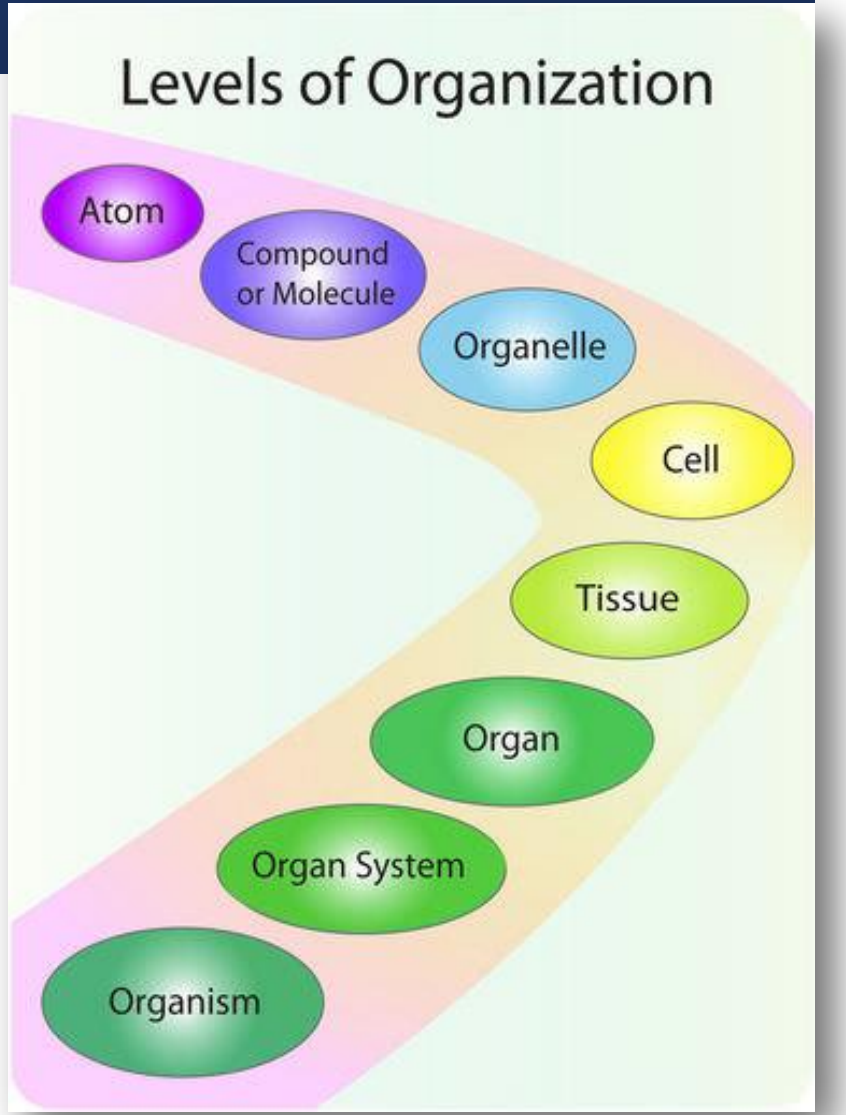
2- **Cellular level** (cells: muscle, nerve and epithelial cells). Cells: the basic structural and functional unit (~ 100 trillion).

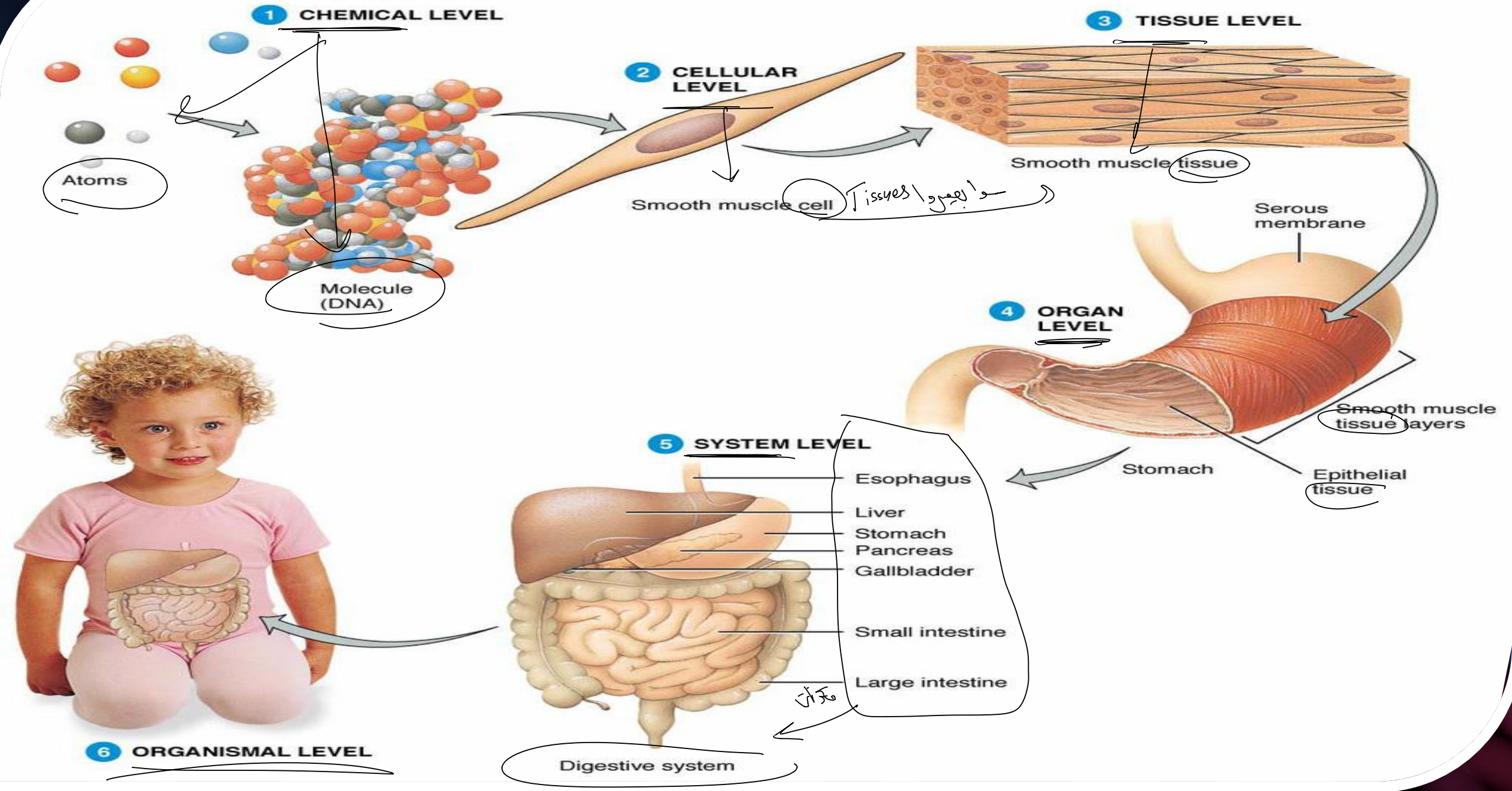
3- **Tissue level** (tissues: epithelial, connective, muscular and nervous tissues).

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

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

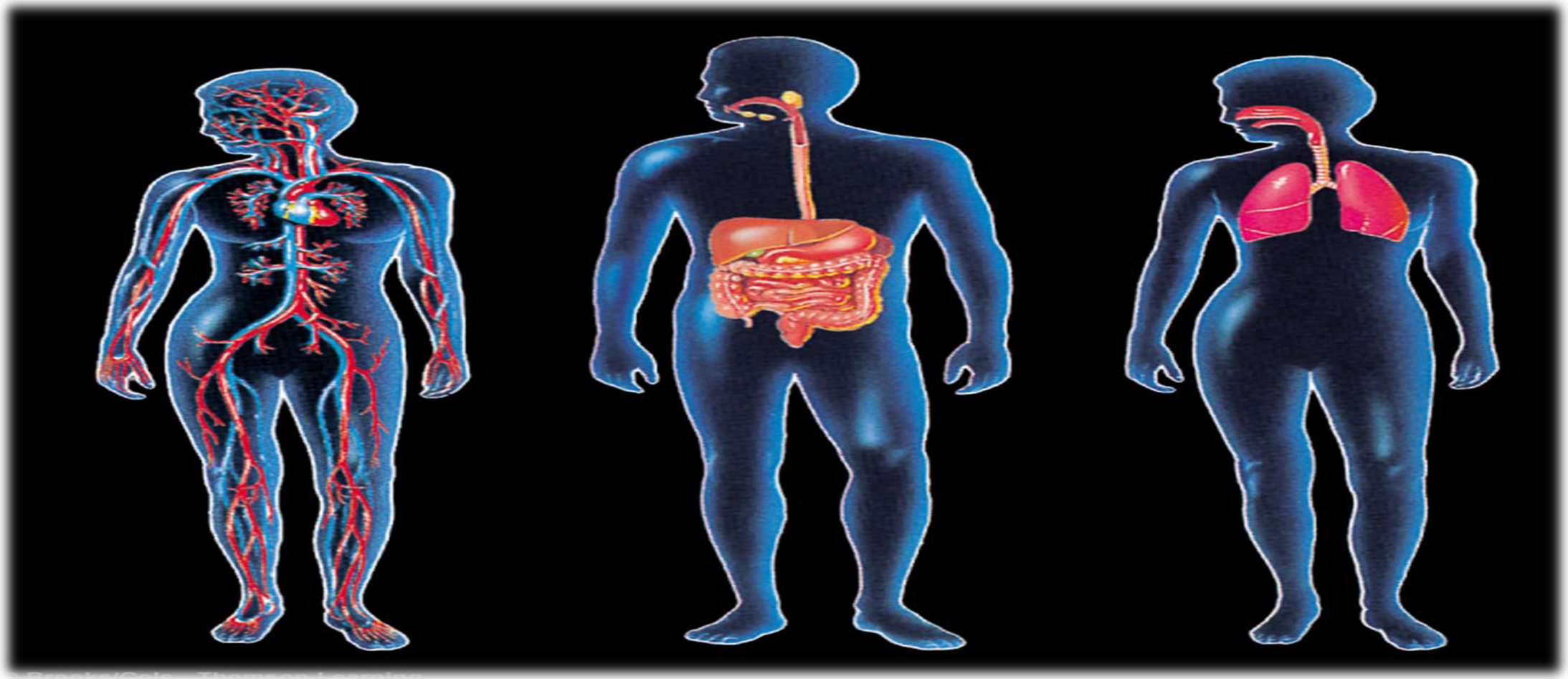
6- **Organismal level**.




1 CHEMICAL LEVEL
Atoms
Molecule (DNA)
2 CELLULAR LEVEL
Smooth muscle cell
3 TISSUE LEVEL
Smooth muscle tissue
Serous membrane
4 ORGAN LEVEL
Smooth muscle tissue layers
Epithelial tissue
Stomach
5 SYSTEM LEVEL
Esophagus
Liver
Stomach
Pancreas
Gallbladder
Small intestine
Large intestine
Digestive system
6 ORGANISMAL LEVEL

SYSTEMS OF THE HUMAN BODY

- Integumentary system
- Skeletal system : support/protection
- Endocrine system : Hormons regulation slow processes
- Cardiovascular system : Transport of gases
- Nervous system Fast + good control
- Muscular system : Body movement / heart
- Respiratory system + CO_2 / O_2 ↓↑ Partial pH Regulation.
- Digestive system Break down + absorbtion of food, waste excretion
- Urinary system : filtration of blood, water + ion balance
- Reproductive system Sexual Reproductive.
- Immune system and lymphatic system Drainage of cellular fluids + ...



Circulatory system
heart, blood,
blood vessels

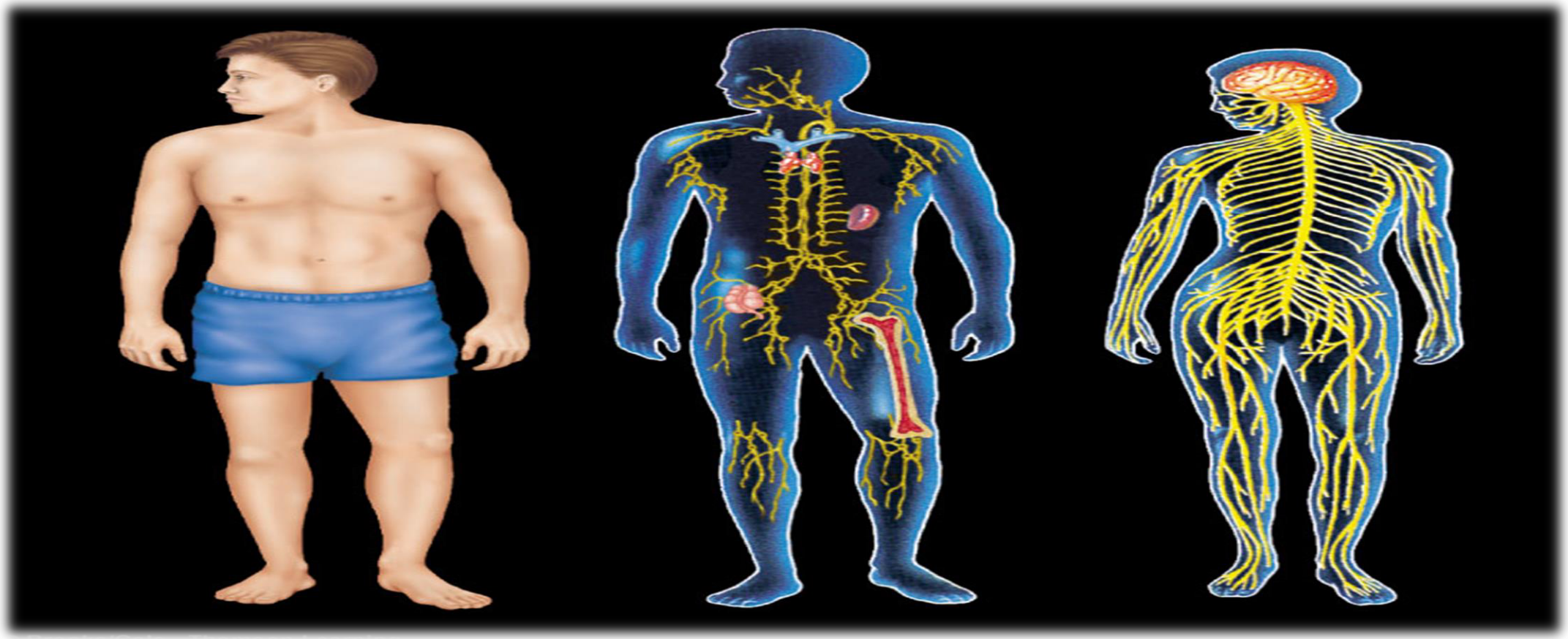
Digestive system
mouth, pharynx, esophagus, stomach,
small intestine, large intestine, salivary
glands, exocrine pancreas, liver,
gallbladder

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

Urinary system
kidneys, ureters, urinary bladder, urethra

Skeletal system
bones, cartilage, joints

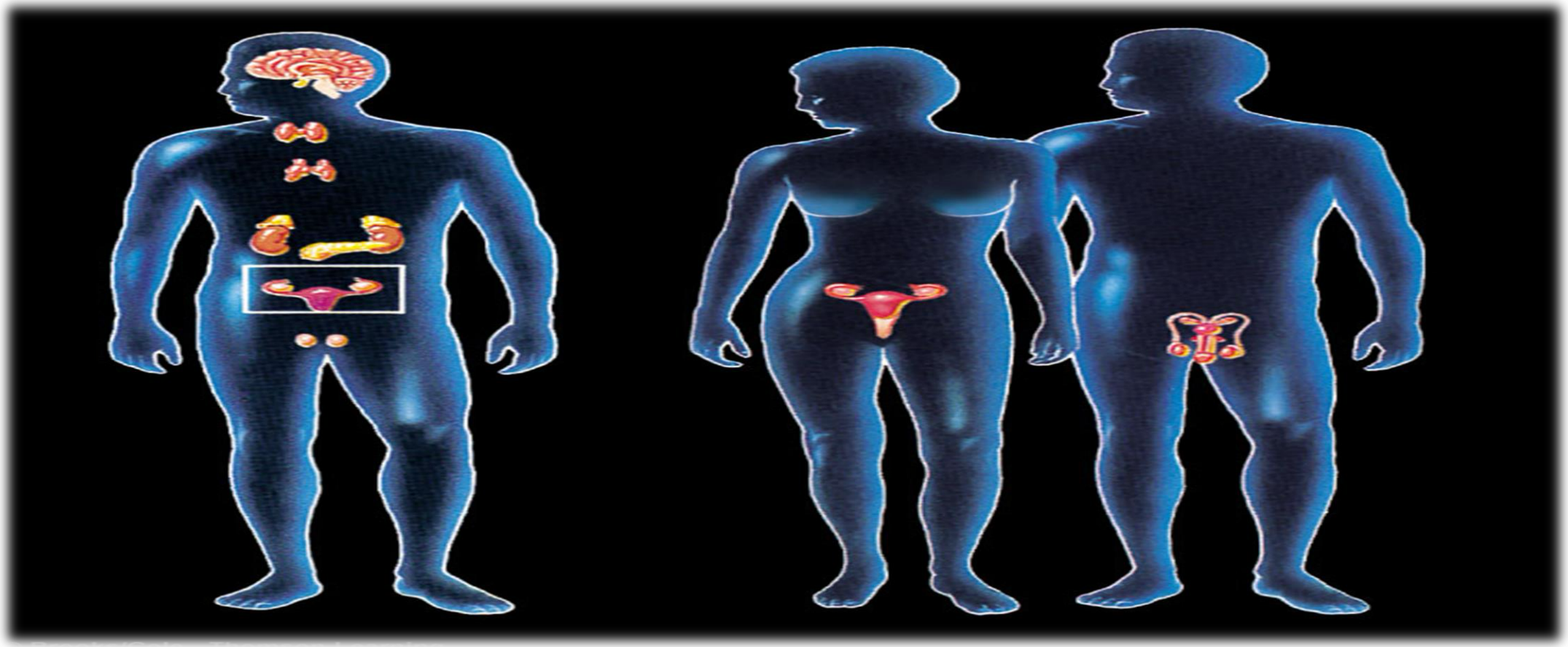
Muscular system
skeletal muscles



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

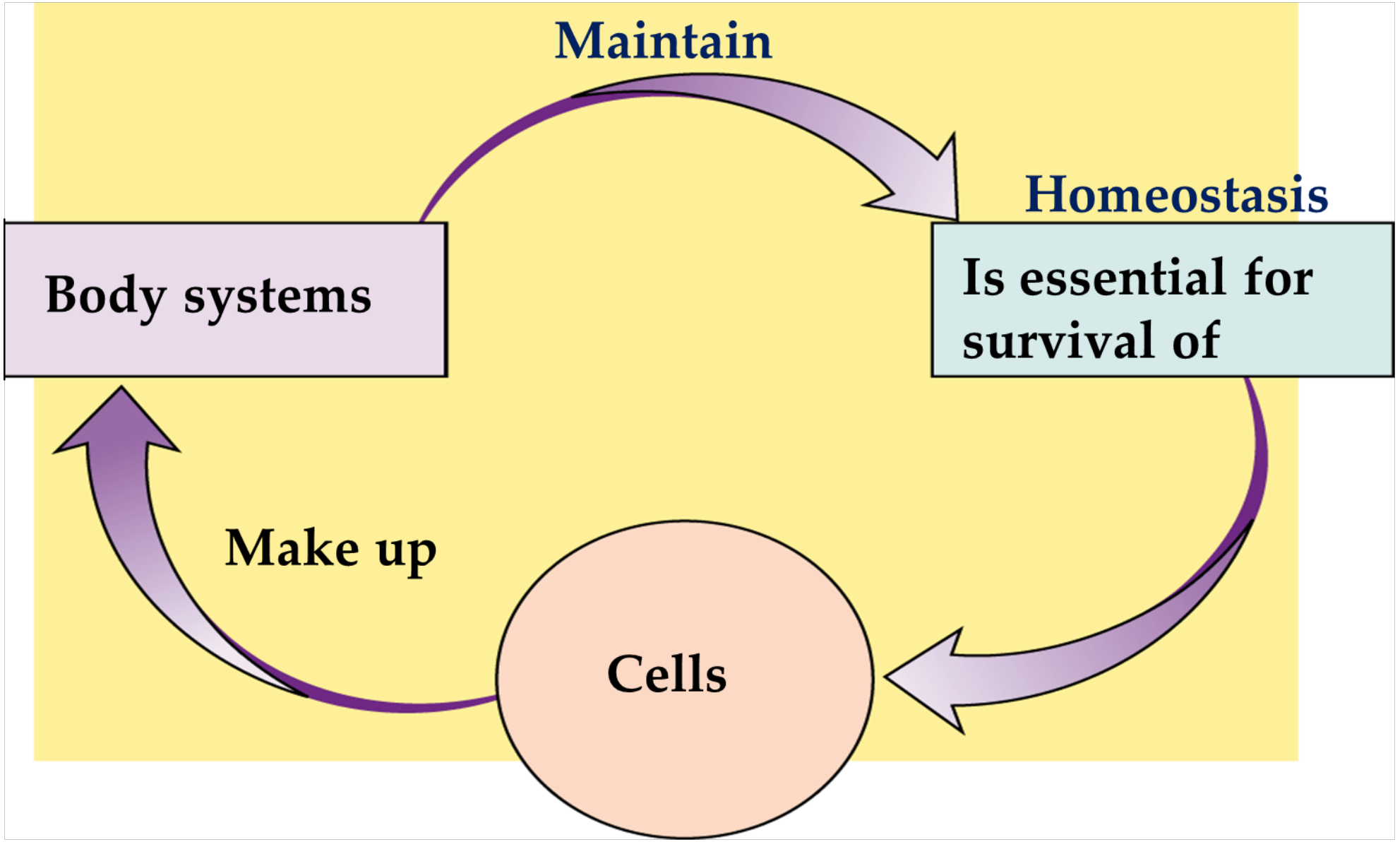
Female: ovaries, oviducts, uterus, vagina, breasts

System	Main Organs	Main Function
Circulatory (Cardiovascular)	Heart, blood, blood vessels	Transports oxygen, nutrients, and wastes throughout the body
Digestive	Mouth, esophagus, stomach, intestines, liver, pancreas	Breaks down food, absorbs nutrients, eliminates solid waste
Respiratory	Nose, pharynx, larynx, trachea, bronchi, lungs	Exchanges gases (oxygen and carbon dioxide)
Urinary	Kidneys, ureters, urinary bladder, urethra	Removes waste, regulates water and salt balance
Skeletal	Bones, cartilage, joints	Supports, protects, stores minerals, aids movement
Muscular	Skeletal muscles	Enables movement, maintains posture, produces heat
Integumentary	Skin, hair, nails	Protects the body, regulates temperature, senses environment
Immune/Lymphatic	Lymph nodes, spleen, thymus, tonsils, white blood cells	Defends against infection, returns fluid to blood
Nervous	Brain, spinal cord, nerves, sensory organs	Controls body activities quickly via nerve impulses
Endocrine	Glands: pituitary, thyroid, adrenals, pancreas, gonads	Secretes hormones to regulate body functions
Reproductive	Male: testes, penis; Female: ovaries, uterus, vagina	Produces gametes and hormones, enables reproduction

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).**

*كل الأعضاء والأنسجة تؤدي وظائف تساعد على الحفاظ على بيئة داخلية ثابتة ← هاد هو ال Homeostasis. [يعني هما الخلايا بتبني الأعضاء، والأعضاء بتبني الأجهزة، والأجهزة بتعمل سوا للحفاظ على ثبات الظروف الداخلية اللازمة لبقاء الخلايا.]


Maintain
Homeostasis
Body systems
Is essential for survival of
Make up
Cells

CHARACTERISTICS OF THE LIVING HUMAN ORGANISM (LIFE PROCESSES)

- Metabolism (catabolism as well as anabolism)
- Responsiveness (detecting and responding to internal or external changes)
- Movement (motion of the whole body)

CHARACTERISTICS OF THE LIVING HUMAN ORGANISM (LIFE PROCESSES)

زيادة حجم أو عدد الخلايا.

Growth (increasing in body size)

التمايز

Differentiation (developing of specialized cells from precursor cells)

بعض خلية بدائية تتحول الى خلية متخصصة له وظيفة عصبية ← خلية عصبية.

التكاثر

Reproduction (cell division or fertilization)

HOMEOSTASIS

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

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

هاد مشمول بـ ECF ← بشمل البلازما والسائل بين الخلايا

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

- **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.**

العضلات

← تبادل المواد بين الشعيرات الدموية لايصال $C_6H_{12}O_6$ / O_2 و
. wastes / CO_2 ازالة

HOMEOSTASIS

Homeostasis in the human body is continually being disturbed,

- From the external environment, the internal environment and psychological stresses.
- Can be temporarily or prolonged.

- 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*

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

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

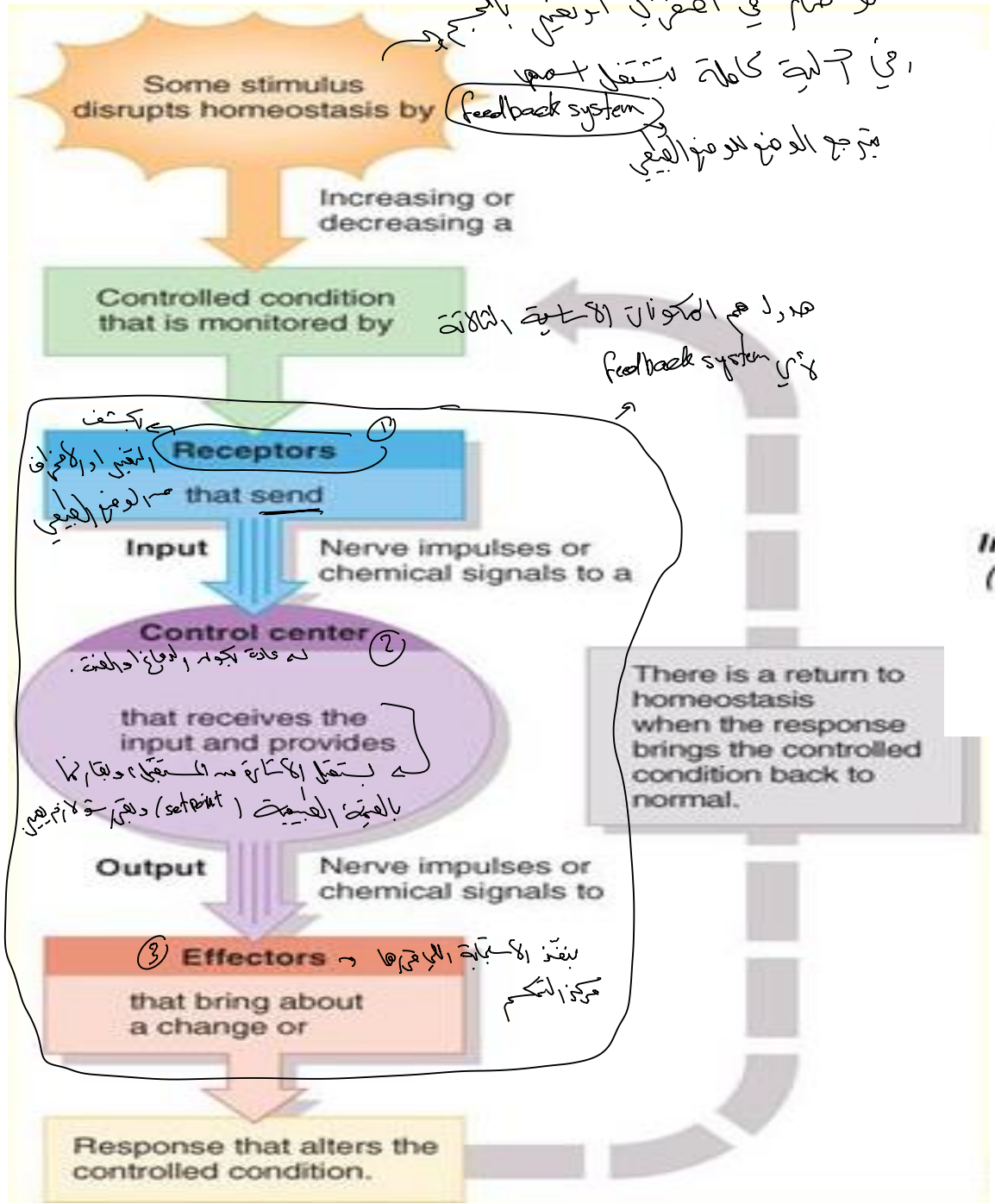
control mechanism:

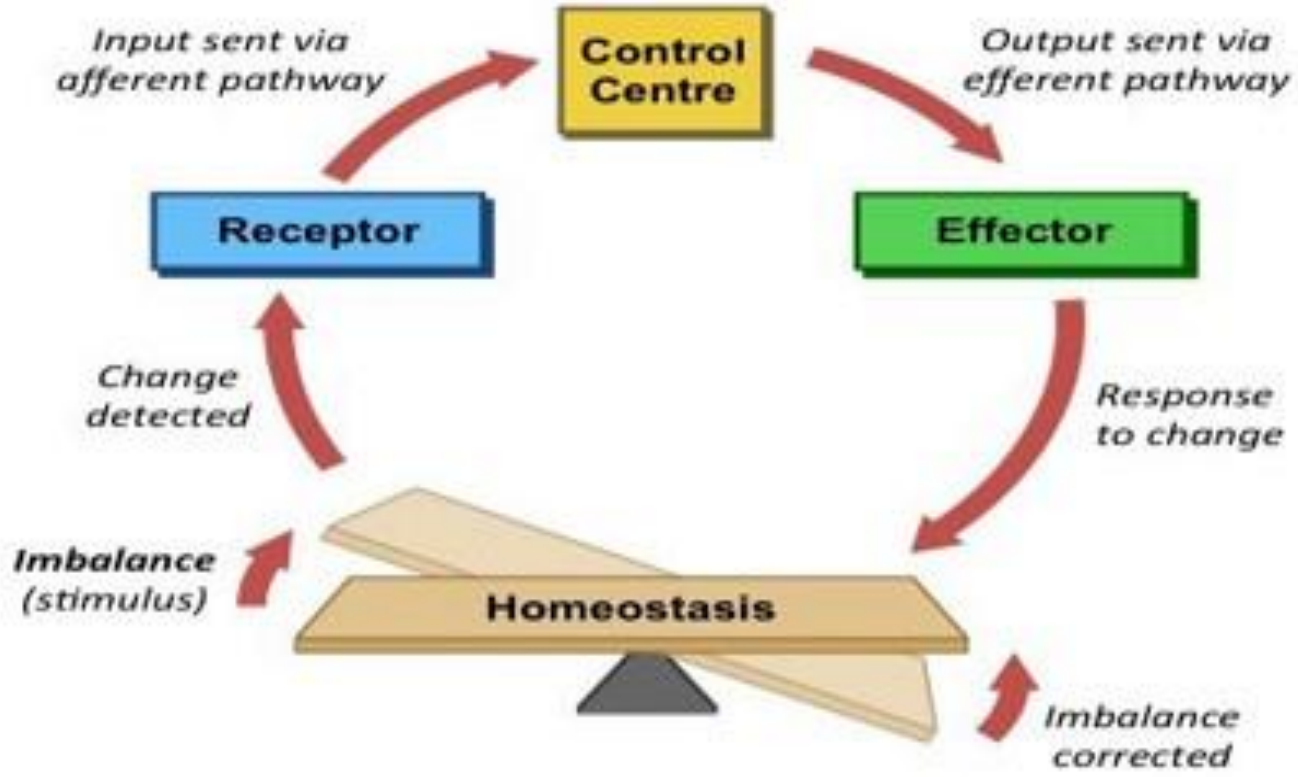
FEEDBACK SYSTEMS

- 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**.)

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

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





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

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

يعني اذا ارتفعت القيمة، الاستجابة بتخفضها - واذا انخفضت القيمة، الاستجابة بترفعها.

- **A negative feedback system reverses the change in a controlled condition.**

امثلة:
① ارتفاع درجة حرارة الجسم ← الجسم بتعرقه ← تنخفض الحرارة.
② انخفاض ضغط الدم ← الجسم يعني جيكاجوه ← يترتر اكثر.
③ ارتفاع ضغط الدم ← القلب يقلل قوة الضخ ← ينخفض الضغط.

النتيجة: النظام يبطئ و يتوقف لما يرجع الوضع الطبيعي
"slows and stops when the controlled condition returns to normal"

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

يقوي او يعزز التغيّر الحاصل.
يعني بدل ماهيكه بزيده.

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

▲ اذا استمر الـ positive fb فممكن يسبب مشاكل خطيرة او حتى قاتلة، بالذات اذا التغيير يخرج عن السيطرة

- **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.**

فيما يتعلق بالـ Homeostasis - تنظيم واتزان الجسم

① السيطرة: متكون داخلية او خارجية (درجة حرارة الجو / عدوى / صدمة نفسية مثلا)

* الأنظمة المسيطرة عبارة عن:

- Nervous system: ارسال اشارات كهربائية Action potentials - سريعة للعضلات والغدد
- Endocrine system: تعديلات أبطأ، تحكم مؤقتة زمنيا - افرازات هرمونات في الدم.

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* control mechanism:

① Receptor: يراقب المتغير (مستقبلات الحرارة)

② Control center: set point - عادة (الدماغ او الغدة) هو الي يحدد ويقيم الاستجابة

③ Effector: هاد الي بنفذ التعديل (عضلات - غدد)

Feedback system

Positive: الاستجابة تقرب المتغير الاصلي صار لحدث معين محدد.
مثال: تخثر الدم.

negative: يعني انه الاستجابة بتعمل عكس المتغير الي صار، لإعادة المتغير الى الوضع الطبيعي.
زي: ① تنظيم الحرارة (بتزيد بالحر مثلا)
② تنظيم سكر الدم (افرازات الانسولين اذا ارتفع)

Quick mnemonics and takeaways

* levels: chemical → Cellular → Tissue → Organ → system → Organism.

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* Homeostasis control parts: R - C - E = Receptor → control → Effector.

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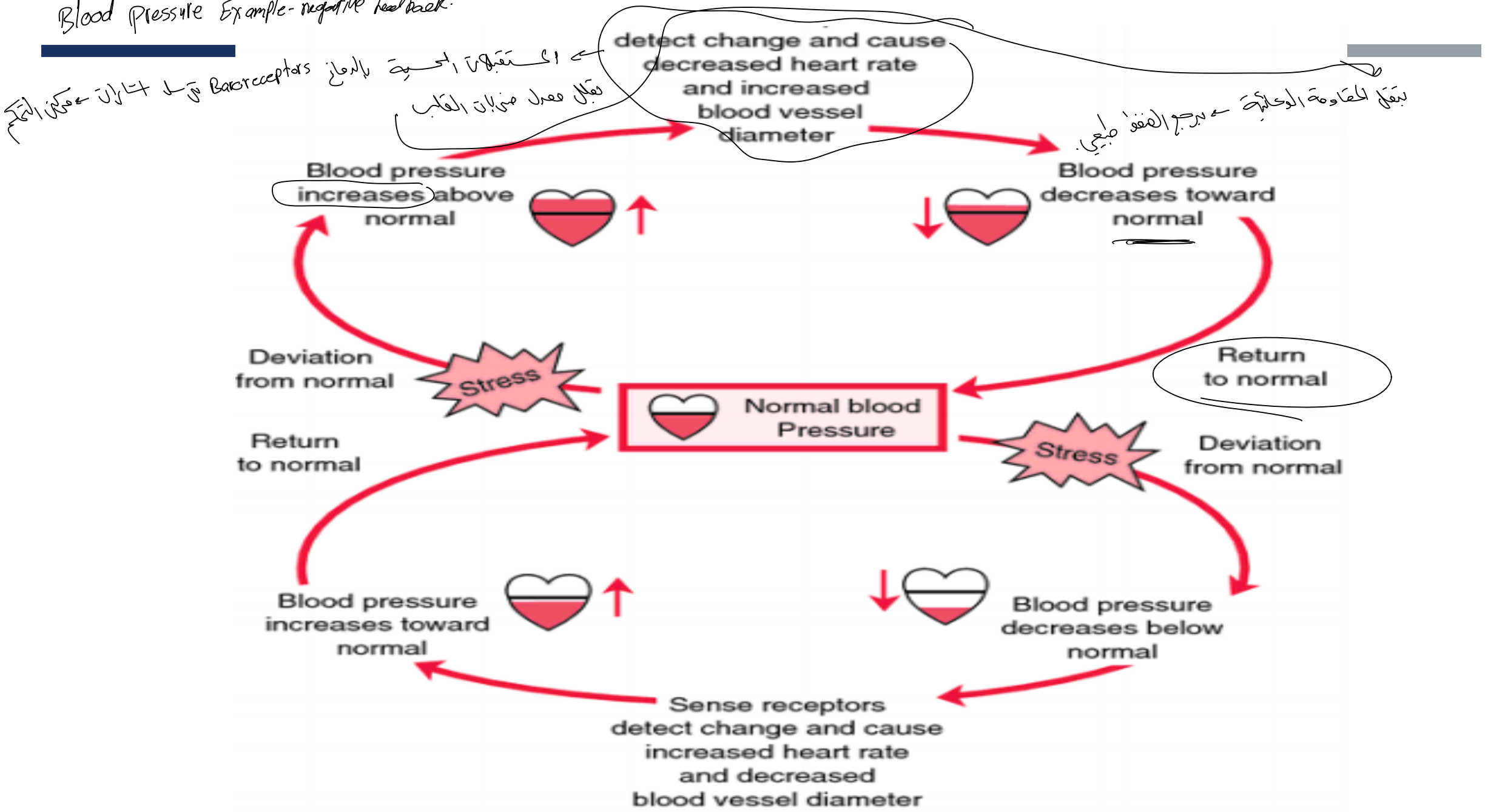
* Negative → Normal regulator (common),

  positive → Rare, Amplifies (clotting).

Blood Pressure Example- negative feedback:



HOMEOSTATIC IMBALANCES

- **Disease is a more specific term for an illness that is characterized by a recognizable set of signs and symptoms.**

1. Local disease affects a specific region of the body.
2. 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**.

symptoms	تغيرات يحس بها المريض بنفسه (subjective) وما يلاحظه المحيطون به مباشرة.	صداع / غثيان / قلة
signs	تغيرات يمكن للمحيطين بالمريض ملاحظتها (objective)	ارتفاع الحرارة / طفح جلدي / تقدم مرتفع.

* العلاقة بين الاضطراب والمرض:

① يعني اضطراب بسيط بالاتزان الداخلي

② لو الجسم ما قدر يعالج المشكلة، ممكن يتطور لمرض.

③ لو ما تم المرض بدون علاج، ممكن يهدد الحياة (Life-threatening)

THANK YOU

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الوظيفة	الترجمة	المفهوم
تعكس التغير وتعيد الجسم للوضع الطبيعي	التغذية الراجعة السلبية	Negative feedback
تعزّز التغير لحين اكتمال حدث معين	التغذية الراجعة الإيجابية	Positive feedback
يصيب منطقة محددة	مرض موضعي	Local disease
يصيب الجسم كله أو أجزاء متعددة	مرض جهازي	Systemic disease
يُشعر به المريض فقط	عرض	Symptom
يلاحظها الطبيب أو تُقاس	علامة	Sign