

Module 1 – Introduction to Physiology

What is Physiology?

- Study of function in living organisms
- Explores mechanisms by which organisms control their internal environments regardless of what happens in the outside (external) environment

Pathology: attempts to explain physical and chemical factors responsible for both normal function and disease

Negative feedback systems

- Perform various functions throughout the body such as maintaining body temperature, and body fluid volumes
- Negative feedback systems contain a set point, a control center (aka integrator), an effector, a controlled variable, and sensor (aka receptor)
- The controlled variable eventually shuts off its own production by the effector

Negative feedback example – heating and cooling the body

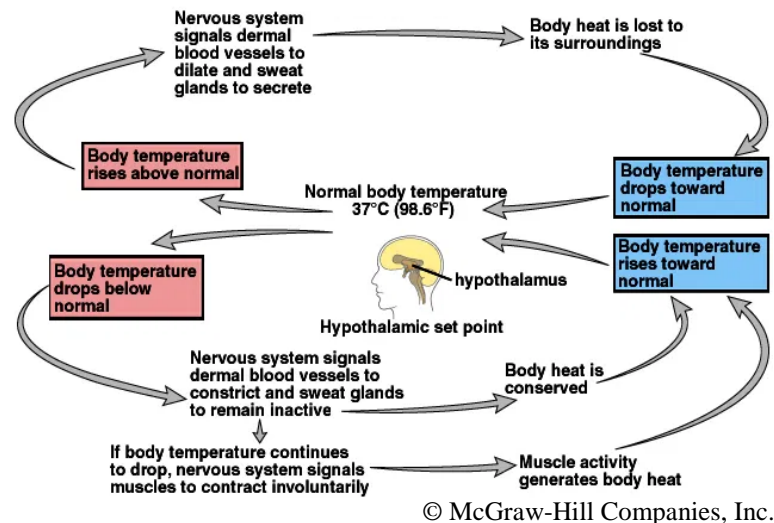
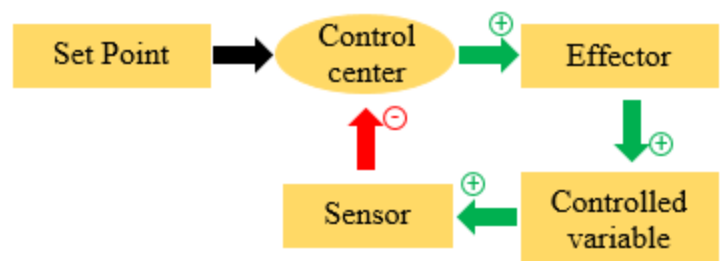
- Body temperature set point: 37°C
 - o Body works to maintain set point
- Control center: hypothalamus (in the brain)
- Effector: organs and systems that generate heat
- Controlled variable: heat
- Sensor: sensors in the nervous system that send signal to control center
 - o Sensors are able to detect when the body returns to 37°C and effectors turn off

Homeostasis

- Maintenance of relatively stable conditions within the internal environment regardless of what is happening in the external environment

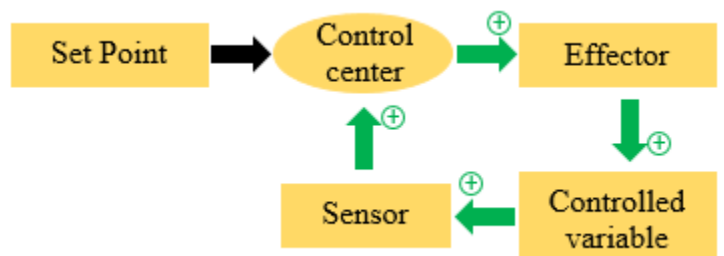
Example: Beach on the Bahamas

Your cells on their own, in a dish on the beach, will dry up and die quickly. The cells in your body won't die and will last longer.



Positive feedback systems

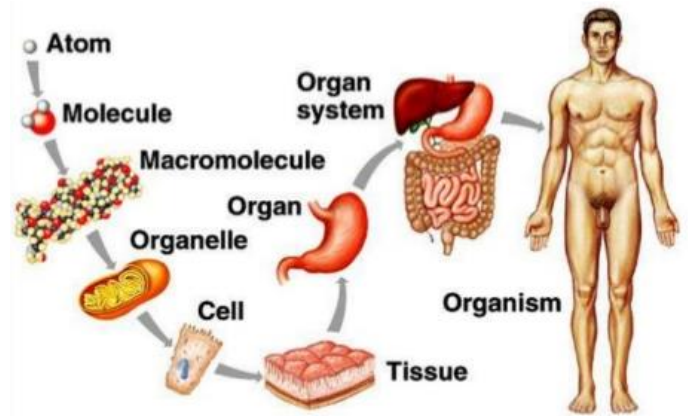
- Controlled variable stimulates its own production
- Self-amplifying mechanisms that can produce rapid change in a physiological system
- Examples of positive feedback systems: generation of action potential in nerve cells, surge of luteinizing hormone causing ovulation.



Negative and Positive Feedback Control Systems

- All systems in the body use negative or positive feedback to regulate their functions and maintain homeostasis
- Feedback mechanisms rely on nervous system and endocrine system to function properly
 - o Nervous system: brain, spinal cord, nerves
 - Allows for rapid communication through neurons and nerves
 - o Endocrine system: hypothalamus, hormonal glands
 - Responds more slowly though release and distribution of hormones in the blood

The Body's Structural Hierarchy



Note:

- Tissue: a group of cells with same specialization
- Organ: 2 or more types of tissues combined to form a functional unit

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Review Questions

1. Which of the following properly explains homeostasis?
 - a. Internal environment and external environment stay the same
 - b. Internal environment stays the same while external environment changes
 - c. Internal environment changes while external environment remains the same
 - d. Internal environment and external environment both change
2. Which of the following systems is considered “outside” the body?
 - a. The respiratory system
 - b. The digestive system
 - c. The autonomic nervous system
 - d. Both A and B
3. Which of the following is a mechanism by which the body can lose heat?
 - a. Involuntary muscle contractions (shivering)
 - b. Decreased sweating
 - c. Increased blood flow to the skin
 - d. Decreased blood flow to the skin
4. Which of the following is not a component of the nervous system involved in feedback control?
 - a. Brain
 - b. Hormonal glands
 - c. Spinal Cord
 - d. Nerves
5. Which of the following is not true regarding a positive feedback system?
 - a. The controlled variable eventually shuts off its own production by the effector
 - b. Controlled variable stimulates its own production
 - c. Self-amplifying mechanisms that can produce rapid change in a physiological system
 - d. Generating action potentials in nerve cells uses a positive feedback system
6. Which of the following regarding the body's structural hierarchy is not true?
 - a. An organ system is composed of several organs cooperating together to achieve a common function
 - b. A tissue is a group of cells with same specialization
 - c. An organ has 2 or more types of tissues combined to form a functional unit
 - d. A macromolecule is composed of several organelles.

Answer Key:

1. B 2. D 3. C 4. B 5. A 6. D