

HUMAN ANATOMY AND PHYSIOLOGY-I, BP-101(T)

UNIT-I (Introduction to human body)

CLASS:3

TOPIC – Homeostasis, Basic anatomical Terminology

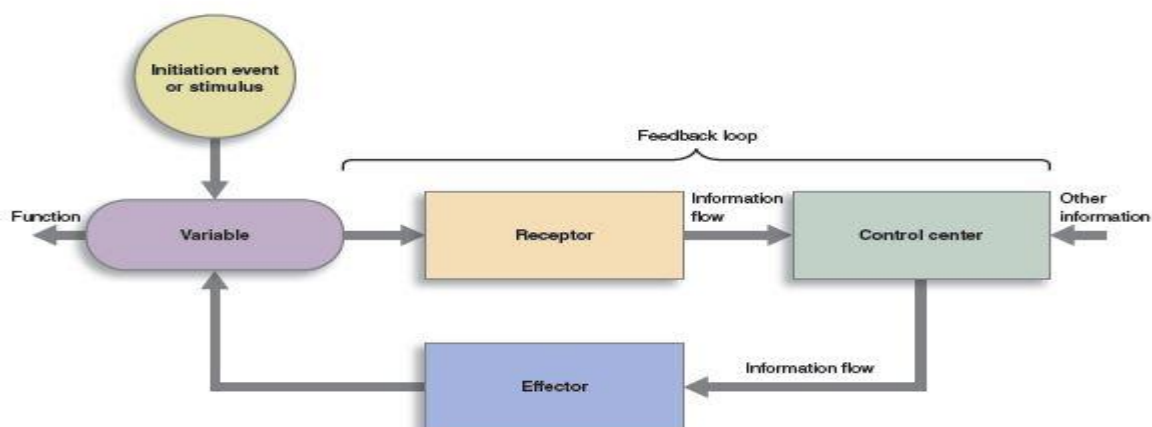
The maintenance of homeostasis in the body typically occurs through the use of feedback loops that control the body's internal conditions.

Feedback loop

A system used to control the level of a variable in which there is an identifiable receptor (sensor), control center (integrator or comparator), effectors, and methods of communication.

We use the following terminology to describe feedback loops:

- Variables are parameters that are monitored and controlled or affected by the feedback system.
- Receptors (sensors) detect changes in the variable.
- Control centers (integrators) compare the variable in relation to a set point and signal the effectors to generate a response. Control centers sometimes consider information other than just the level of the variable in their decision-making, such as time of day, age, external conditions, etc.
- Effectors execute the necessary changes to adjust the variable.
- Methods of communication among the components of a feedback loop are necessary in order for it to function. This often occurs through nerves or hormones, but in some cases receptors and control centers are the same structures, so that there is no need for these signaling modes in that part of the loop.

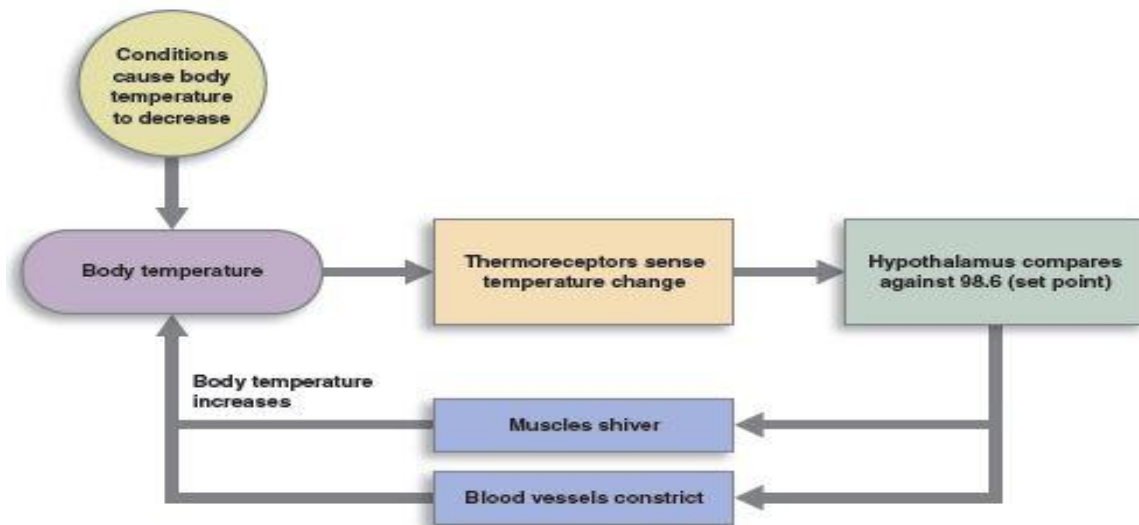


Feedback cycle

- Any situation in which a variable is regulated and the level of the variable impacts the direction in which the variable changes (i.e. increases or decreases), even if there is not clearly identified loop components.
- Homeostasis can be described as the totality of the feedback loops and feedback cycles that the body incorporates to maintain a suitable functioning status.
- Air conditioning is a technological system that can be described in terms of a feedback loop.
- The thermostat senses the temperature, an electronic interface compares the temperature against a set point (the temperature that you want it to be).
- If the temperature matches or is cooler, then nothing happens.
- If the temperature is too hot, then the electronic interface triggers the air-conditioning unit to turn on.
- Once the temperature is lowered sufficiently to reach the set point, the electronic interface shuts the air-conditioning unit off.
- For this example, identify the steps of the feedback loop.
- Cruise control is another technological feedback system.
- The idea of cruise control is to maintain a constant speed in your car. The car's speed is determined by the speedometer and an electronic interface measures the car's speed against a set point chosen by the driver.
- If the speed is too slow, the interface stimulates the engine; if the speed is too fast, the interface reduces the power to the tires.

Terms Applied to Temperature

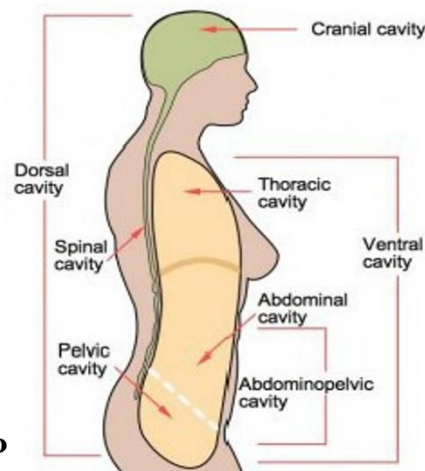
Consider one of the feedback loops that controls body temperature.



- **Variable:** In this instance, the variable is body temperature.
- **Receptors:** Thermoreceptors detect changes in body temperature. For example, thermoreceptors in your internal organs can detect a lowered body temperature and produce nerve impulses that travel to the control center, the hypothalamus.
- **Control Center:** The hypothalamus controls a variety of effectors that respond to a decrease in body temperature.
- **Effectors:** There are several effectors controlled by the hypothalamus.
 - blood vessels near the skin constrict, reducing blood flow (and the resultant heat loss) to the environment.
 - Skeletal muscles are also effectors in this feedback loop: they contract rapidly in response to a decrease in body temperature. This shivering helps to generate heat, which increases body temperature.

Body Cavities

Body cavities are areas in the body that contain our internal organs. The dorsal and ventral cavities are the two main cavities. The dorsal cavity is on the posterior (back side) of the body and contains the cranial cavity and spinal cavity. In human anatomy, dorsal, caudal and posterior mean the same thing. The ventral cavity is on the front (anterior) of the body and is divided into the thoracic cavity (chest) and abdominopelvic cavity.

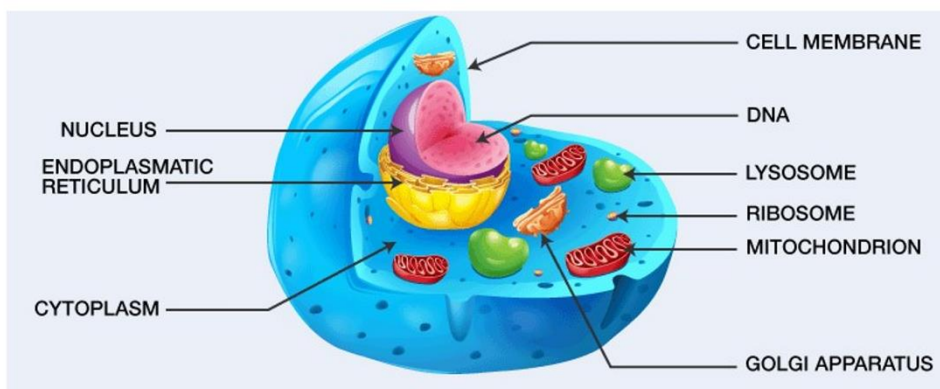


The dorsal cavity is further divided into subcavities:

- Cranial cavity (also called the calvaria) which surrounds and holds the brain
- Vertebral cavity (also called the spinal cavity) which includes the vertebrae (Spinal column) and spinal cord .

Cellular level of Organization

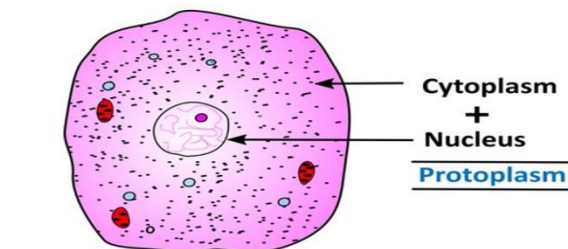
Structure of Cell



A cell is defined as the smallest, basic unit of life that is responsible for all of life's processes.

The cell structure comprises individual components with specific functions essential to carry out life's processes. These components include- cell wall, cell membrane, cytoplasm, nucleus, and cell organelles.

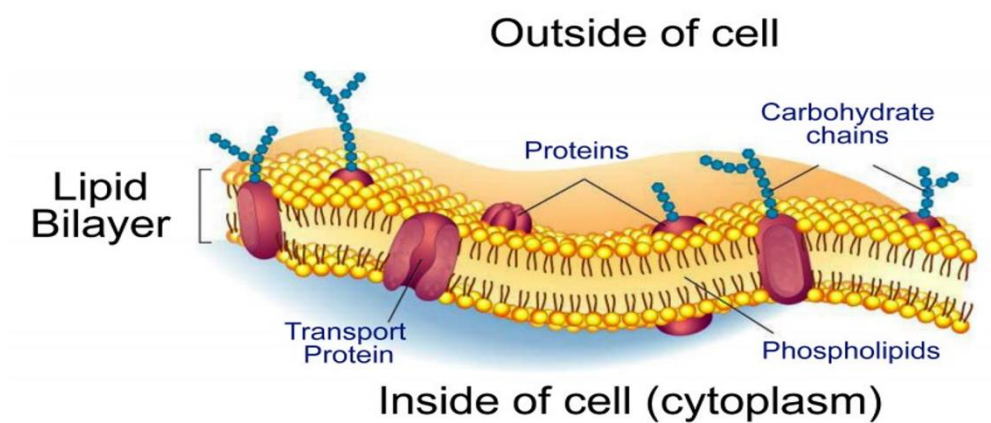
Protoplasm



All living matter except cell membrane in cell are called protoplasm.

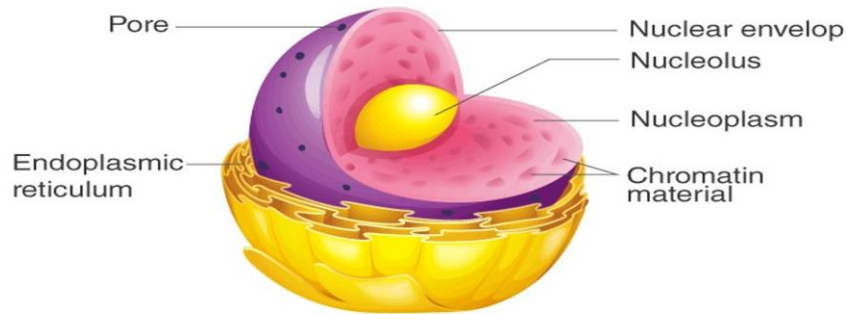


Cell Membrane



Nucleus

(Brain of the cell)



Cell Organelle and its Functions

Organelle	Structure	Function
Cell surface membrane		- Controls passage of entry of substance into the cell - Site of cell communication via receptors
Nucleus		- Stores DNA - Nuclear pores allow mRNA & ribosomes to pass through
Mitochondria		Carry out aerobic respiration to produce ATP
Lysosomes		Contains digestive enzymes to break down pathogens, old organelles, cells & food molecules
Ribosomes		Site of protein synthesis
Rough endoplasmic reticulum		Provide a large surface area for protein synthesis
Smooth endoplasmic reticulum		Synthesise, store and transport lipids and carbohydrates.
Golgi Apparatus		- Modifies proteins - Sort, package, and transport molecules around the cell

IMPORTANT QUESTIONS:

2M QUESTIONS:

1. Define Anatomy and Physiology along with its scope.
2. Define Homeostasis.
3. What is feedback system.
4. Define cell. Write the functions of mitochondria.
5. Differentiate mitosis and meiosis.
6. Differentiate Phagocytosis and Pinocytosis.
7. Define: 1. Facilitated transport 2. Osmosis transport.
8. Differentiate exocrine and endocrine signaling.
9. Define Autocrine and Juxtacrine signaling.
10. Define tissue and its types with examples.

5M QUESTIONS

- 1) Draw a labelled diagram cell showing its cell organelles and their function.
- 2) Define tissue and its types in detail.
- 3) What is cell cycle and explain in detail.
- 4) What is cell division and explain its types.
- 5) What are different cell junctions.
- 6) Explain cell signaling and cell communication.
- 7) What is homeostasis and explain its feedback mechanism

10 M QUESTIONS

1. Define tissue and its types in detail.
2. What are different cell junctions.
3. Explain cell signaling and cell communication.