Homeostasis Definition

"Homeostasis is the state of steady internal chemical and physical conditions maintained by living systems."

Homeostasis Meaning and Etymology

The theory of homeostasis was first introduced by Claude Bernard, a French Physiologist in the year 1865, and the term was first used in 1926 by Walter Bradford Cannon. Bradford derived Homeostasis from the ancient Greek words *ὅμοιος* (pronounced: hómoios) and *ἵστημι* (pronounced: hístēmi). The combination of these words translates to "similar" and "standing still" respectively.

What is Homeostasis?

Homeostasis is quite crucial for the survival of organisms. It is often seen as a resistance to changes in the external environment. Furthermore, homeostasis is a self-regulating process that regulates internal variables necessary to sustain life.

In other words, homeostasis is a mechanism that maintains a stable internal environment despite the changes present in the external environment.

The body maintains homeostasis by controlling a host of variables ranging from body temperature, blood pH, blood glucose levels to fluid balance, sodium, potassium and calcium ion concentrations.

Regulation of Homeostasis

The regulation of homeostasis depends on three mechanisms:

1. Effector.
2. Receptor.
3. Control Center.

The entire process continuously works to maintain homeostasis regulation.

Receptor

As the name suggests, the receptor is the sensing component responsible for monitoring and responding to changes in the external or internal environment.

Control Center

The control centre is also known as the integration centre. It receives and processes information from the receptor.

Effector

The effector responds to the commands of the control centre. It could either oppose or enhance the stimulus.

An Example of Homeostasis in Action	
Receptor	Cutaneous receptors of the skin.
Control centre	Brain.
Effector	Blood vessels and sweat glands in the skin.
The skin has receptors that detect changes in temperature. If the external temperature rises or drops below the equilibrium, the control centre sends signals to the blood vessels and sweat glands in our skin to react accordingly. If the temperature is too hot, the blood vessels dilate (vasodilation) and cause a drop in the body temperature. Moreover, sweat glands produce sweat to accompany vasodilation. If the external temperature is too cold, the blood vessels constrict (vasoconstriction) and enable the body to retain heat.	

Homeostasis Breakdown

The failure of homeostasis function in an internal environment will result in illnesses or diseases. In severe cases, it can even lead to death and disability.

Many factors can affect homeostasis. The most common are:

- Genetics.
- Physical condition.
- Diet and nutrition.
- Venoms and toxins.

- Psychological health.
- Side effects of medicines and medical procedures.

Body Systems and Homeostasis

The body system participates in maintaining homeostasis regulations. The purpose of the body system is to describe several controlling mechanisms where every system contributes to homeostasis.

Listed below are the tables which describe how different organs perform different functions to maintain the internal body environment.

Formed Elements	
Name	**Function**
Platelets	It assists blood clotting.
Red blood cells	Helps in transporting hydrogen and oxygen ions.
White blood cells	It fights against infections.

Plasma	
Component	**Function**
Nutrients	Required for cellular metabolism.
Proteins	Create osmotic pressure, aids clotting, and helps buffer blood.
Hormones	Known as chemical messengers.
Water	Provides fluid environment.

Salts	Helps in metabolic activity and aids the buffer in blood.
Wastes	Produced by cellular metabolism.

Nervous System	
Central Nervous System	
Cerebrum	Consciousness, creativity, thoughts, morals, memory, etc.
Lower portions	Reception of sensory data, coordination of muscular activity, homeostasis.
Spinal cord	Automatic reflex actions.
Peripheral Nervous System	
Autonomic system	Cranial and spinal motor nerves that control internal organs.
Cranial nerves, spinal nerves	Carry sensory information to motor impulses from the CNS.

Major Endocrine Glands and Their Hormones	
Hormone	**Function**
Adrenal medulla	
Epinephrine and Norepinephrine	Stimulates fight or flight response
Adrenal cortex	

Glucocorticoids (e.g., cortisol)	Promotes gluconeogenesis
Mineralocorticoids (e.g., aldosterone)	Promotes sodium re-absorption by kidneys
Anterior pituitary	
Thyroid-stimulating hormones	Stimulates thyroid gland.
Adrenocorticotropic hormones	Stimulates adrenal cortex gland.
Gonadotropin hormones	Stimulates gonads.
Gonads	
Androgen (male) Estrogen and progesterone (female)	Promotes secondary sexual characteristics.
Hypothalamus	
Hypothalamic-releasing hormones	Regulates anterior pituitary hormones.
Posterior pituitary	
Anti-diuretic hormone	Promotes water reabsorption by kidneys.
Parathyroid	
Parathyroid hormone	Maintains blood calcium and phosphorus levels.
Thyroid	
Thyroid hormones	Increases metabolic rates.

Pancreas	
Insulin	Lowers blood sugar level.
Glucagon	Raises blood sugar level.

Other Examples of Homeostasis

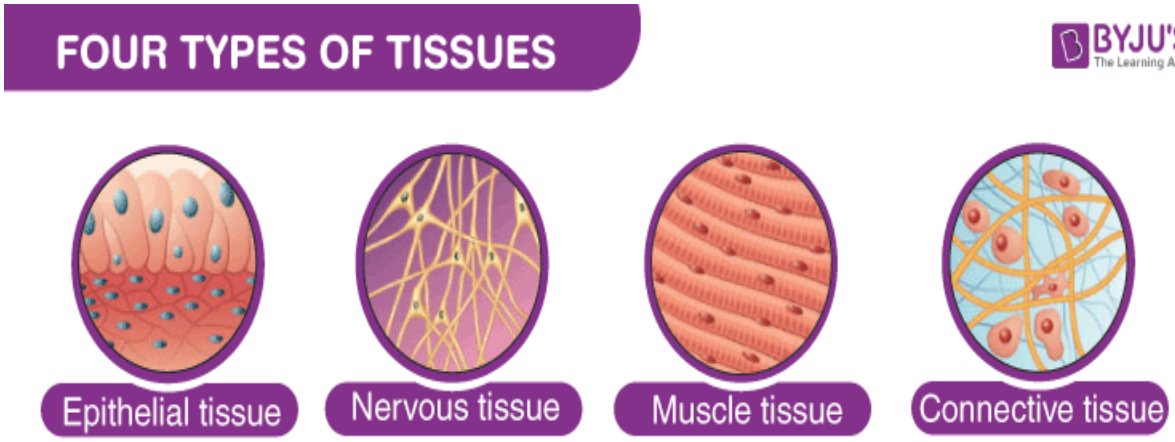
1. Blood glucose homeostasis.
2. Blood oxygen content homeostasis.
3. Extracellular fluid pH homeostasis.
4. Plasma ionized calcium homeostasis.
5. Arterial blood pressure homeostasis.
6. Core body temperature homeostasis.
7. The volume of body water homeostasis.
8. Extracellular sodium concentration homeostasis.
9. Extracellular potassium concentration homeostasis.
10. Blood partial pressure of oxygen and carbon dioxide homeostasis.

Tissue

In simple terms, tissue can be defined as a group of cells with similar shape and function are termed as tissues. They form a cellular organizational level, intermediate between the cells and organ system. Organs are then created by combining the functional groups of tissues.

The study of tissue is known as histology and study of disease-related to tissue is known as histopathology. The standard tools for studying tissues is by embedding and sectioning using the paraffin block.

Types of Animal Tissues



Animal tissues are grouped into four types:

- Connective Tissue
- Muscle Tissue
- Nervous Tissue
- Epithelial Tissue

The collection of tissues are joined in structural units to serve a standard function of organs. The primary purpose of these four types of tissue differs depending on the type of organism.

For example, the origin of the cells comprising a particular tissue type also differs.

TYPES OF BODY TISSUES:

Connective Tissues

They are the group of tissues made up of cells separated by non-living material, called as an extracellular matrix. This tissue provides shape to the different organs and maintains their positions. For example, blood, bone, tendon, adipose, ligament and areolar tissues. There are three types of connective tissue:

- Fluid Connective Tissue.
- Fibrous Conctive Tissue.
- Skeletal Connective Tissue.

Functions of Connective Tissue

The connective tissue functions by providing shape and maintains the position of different organs in the body. It functions as the primary supporting tissue of the body. Other important and the major functions of connective tissue in the body are:

1. Insulating.
2. Helps in binding the organs together and provides support.
3. It protects against the invasions of pathogens by their phagocytic activity.
4. Provides shape to the body, conserves body heat and also stores energy.
5. It is involved in the transportation of water, nutrients, minerals, hormones, gases, wastes, and other substances within the body.

Muscle Tissue

They are involved in producing force and generating motion, either for the locomotion or for other body movements within internal organs. There are three types of muscle tissue:

- Skeletal Muscle – they are typically attached to bones
- Cardiac Muscle – found in the heart.
- Visceral or Smooth Muscle – they are found in the inner walls of organs.

Functions of Muscle Tissue

Muscle tissues are associated with their movements including walking, running, lifting, chewing, picking and dropping objects, etc. The other major functions of muscle tissue in the body are:

1. Helps in maintaining an erect position, or posture.
2. Helps in the constriction of organs and blood vessels.
3. Involved in both voluntary and involuntary movements.
4. Involved in pumping blood and regulating the flow of blood in arteries.
5. Controls respiration by automatically driving the movement of air both into and out of our body.

Nervous Tissue

They are the main tissue components of the brain and spinal cord in the central nervous system. While, in the peripheral nervous system, the neural tissue forms the cranial nerves and spinal nerves.

Functions of Nervous Tissue

The nervous tissue forms the communication network of the nervous system and is important for information processing. The other major functions of nervous tissue in the body are:

- Response to stimuli.
- Stimulates and transmits information within the body.
- Plays a major role in emotions, memory, and reasoning.
- Maintains stability and creates an awareness of the environment.
- Nervous tissue is involved in controlling and coordinating many metabolic activities.

Epithelial Tissue

They are formed by cells which cover the external parts of the body organs and lines the organ surfaces such as the surface of the skin, the reproductive tract, the airways, and the inner lining of the digestive tract.

Functions of Epithelial Tissue

This tissue performs a wide variety of functions including:

1. Play a major role in sensory reception, excretion, filtration and other metabolic activities.
2. Provide mechanical strength and resistance to the underlying cells and tissue.
3. It is involved in the movement of materials through the process of filtration, diffusion and secretion.
4. Protects the internal organs against the invasions of pathogens, toxins, physical trauma, radiation, etc.

   Epithelial tissues are also involved in secreting hormones, enzymes, mucus and other products from ducts and transporting it to the circulatory system.