

**CELL ,CELL TRANSPORT**

**HOMEOSTASIS**

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# CELL

## WHAT IS CELL?

- All the living things are composed of cells. A single cell is the smallest unit that has all the characteristics of life. Cell is defined as the structural and functional unit of the living body.



# GENERAL CHARACTERISTIC OF CELL

Each cell in the body:

1. Needs nutrition and oxygen
2. Produces its own energy necessary for its growth, repair and other activities
3. Eliminates carbon dioxide and other metabolic wastes
4. Maintains the medium, i.e. the environment for its survival



# TISSUE

Tissue is defined as the group of cells having similar function.



# ORGAN

An organ is defined as the structure that is formed by two or more primary types of tissues, which execute the functions of the organ



# ORGAN SYSTEM

The organ system is defined as a group of organs that work together to carry out specific functions of the body.

## STRUCTURE OF CELL

Each cell is formed by a cell body and a membrane covering the cell body called the cell membrane. The cell body has two parts, namely nucleus and cytoplasm surrounding the nucleus. Thus, the structure of the cell is studied under three headings: 1. Cell membrane 2. Cytoplasm 3. Nucleus.



# CELL MEMBRANE

Cell membrane is a protective sheath, enveloping the Acell body. It is also known as plasma membrane or plasmalemma

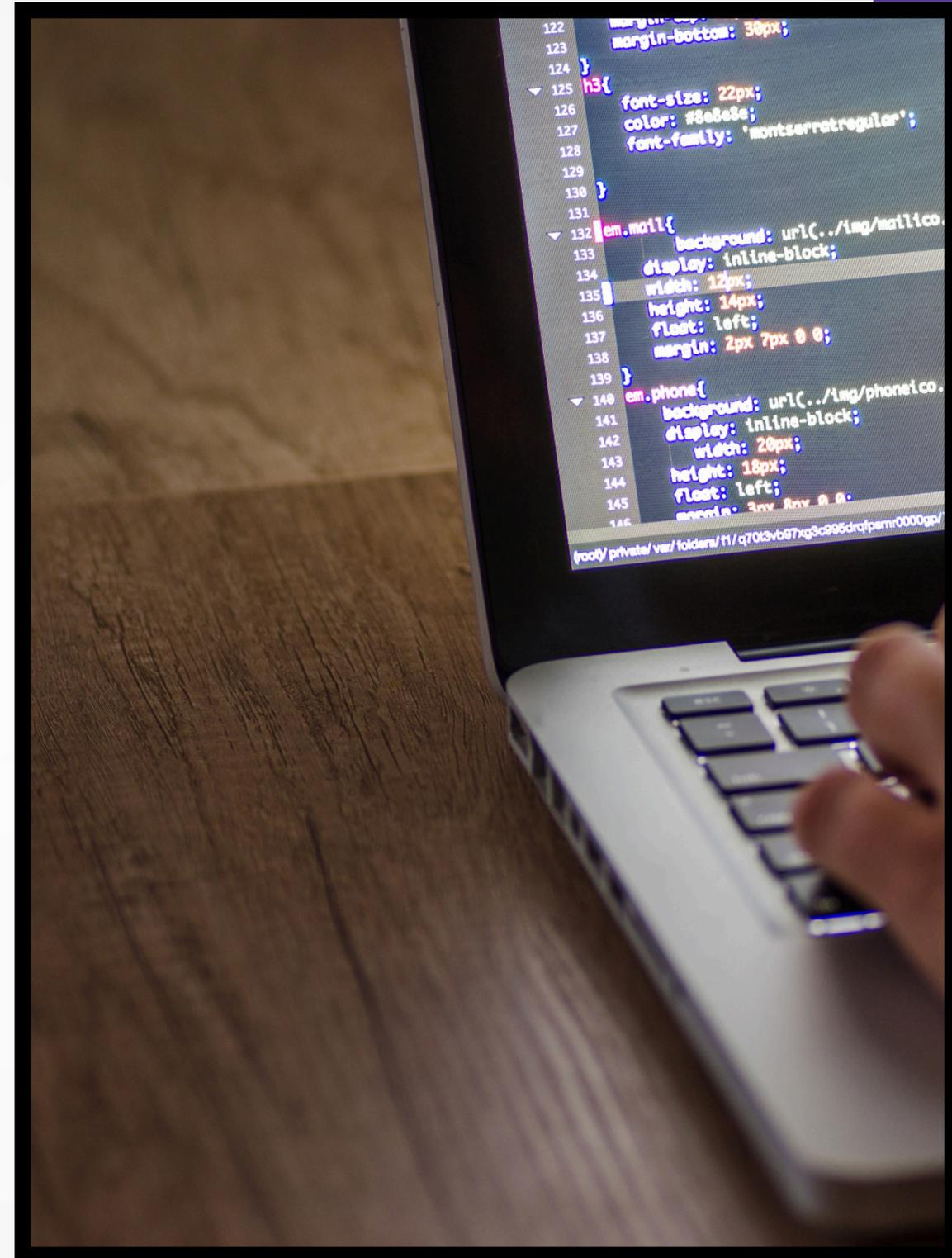
## • COMPOSITION

Cell membrane is composed of three types of substances:  
1. Proteins (55%) 2. Lipids (40%) 3. Carbohydrates (5%).



# STR.OF CELL MEMBRANE

On the basis of structure, cell membrane is called a unit membrane or a three-layered membrane. The electron microscopic study reveals three layers of cell membrane, namely, one central electron-lucent layer and two electron-dense layers.



# CYTOPLASM

Cytoplasm of the cell is the jellylike material formed by 80% of water. It contains a clear liquid portion called cytosol and various particles of different shape and size

Cytoplasm is made up of two zones: 1. Ectoplasm: Peripheral part of cytoplasm, situated just beneath the cell membrane 2. Endoplasm: Inner part of cytoplasm, interposed between the ectoplasm and the nucleus.



- **ENDOPLASMIC RETICULUM**

Endoplasmic reticulum is a network of tubular and microsomal vesicular structures which are interconnected with one another.

- **GOLGI APPARATUS**

Golgi apparatus or Golgi body or Golgi complex is a membrane-bound organelle, involved in the processing of proteins. It is present in all the cells except red blood cells



- **LYSOSOME**

Lysosomes are the membrane-bound vesicular organelles found throughout the cytoplasm. The lysosomes are formed by Golgi apparatus.

- **MITOCHONDRION**

Mitochondrion (plural = mitochondria) is a membranebound cytoplasmic organelle concerned with production of energy.



# ● CYTOSKELETON

Cytoskeleton is the cellular organelle present throughout the cytoplasm. It determines the shape of the cell and gives support to the cell

# ● NUCLEUS

Nucleus is the most prominent and the largest cellular organelle. It has a diameter of  $10\ \mu$  to  $22\ \mu$  and occupies about 10% of total volume of the cell.





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# HOMEOSTASIS

- ‘Homeostasis’ refers to the maintenance of constant internal environment of the body (homeo = same; stasis = standing)
  - Importance of internal environment was notified by the great biologist of 19th century Claude Bernard.
  - The word ‘homeostasis’ was introduced by Harvard Professor, Walter B Cannon in 1930.
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# COMPONENTS OF HOMEOSTATIC SYSTEM

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Homeostatic system in the body acts through selfregulating devices, which operate in a cyclic manner. This cycle includes four components:

1. **Sensors** or detectors, which recognize the deviation
2. Transmission of this message to a **control center**
3. Transmission of information from the control center to the effectors for correcting the deviation  
Transmission of the message or information may be an **electrical process** in the form of impulses through nerves or a **chemical process** mainly in the form of hormones through blood and body fluids
4. **Effectors**, which correct the deviation.

# MECHANISM

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Homeostatic mechanism in the body is responsible for maintaining the normalcy of various body systems. Whenever there is any change in behavioral pattern of any system, the effectors bring back the normalcy either by inhibiting and reversing the change or by supporting and accelerating the change depending upon requirement of the situation. This is achieved by means of feedback signals

## NEGATIVE FEEDBACK

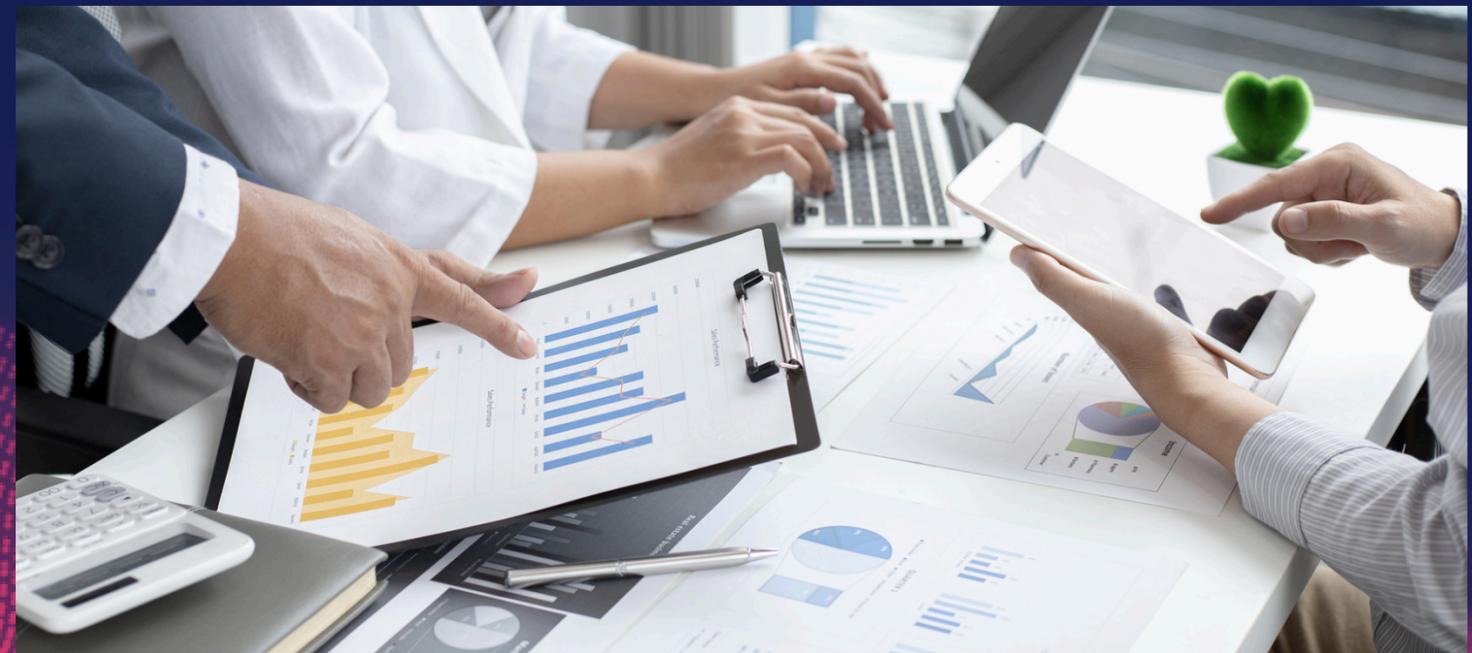
Negative feedback is the one to which the system reacts in such a way as to arrest the change or reverse the direction of change

## POSITIVE FEEDBACK

Positive feedback is the one to which the system reacts in such a way as to increase the intensity of the change in the same direction

# NEGATIVE FEEDBACK MECHANISM

- Negative feedback is the one to which the system reacts in such a way as to arrest the change or reverse the direction of change
- After receiving a message, effectors send negative feedback signals back to the system. Now, the system stabilizes its own function and makes an attempt to maintain homeostasis.



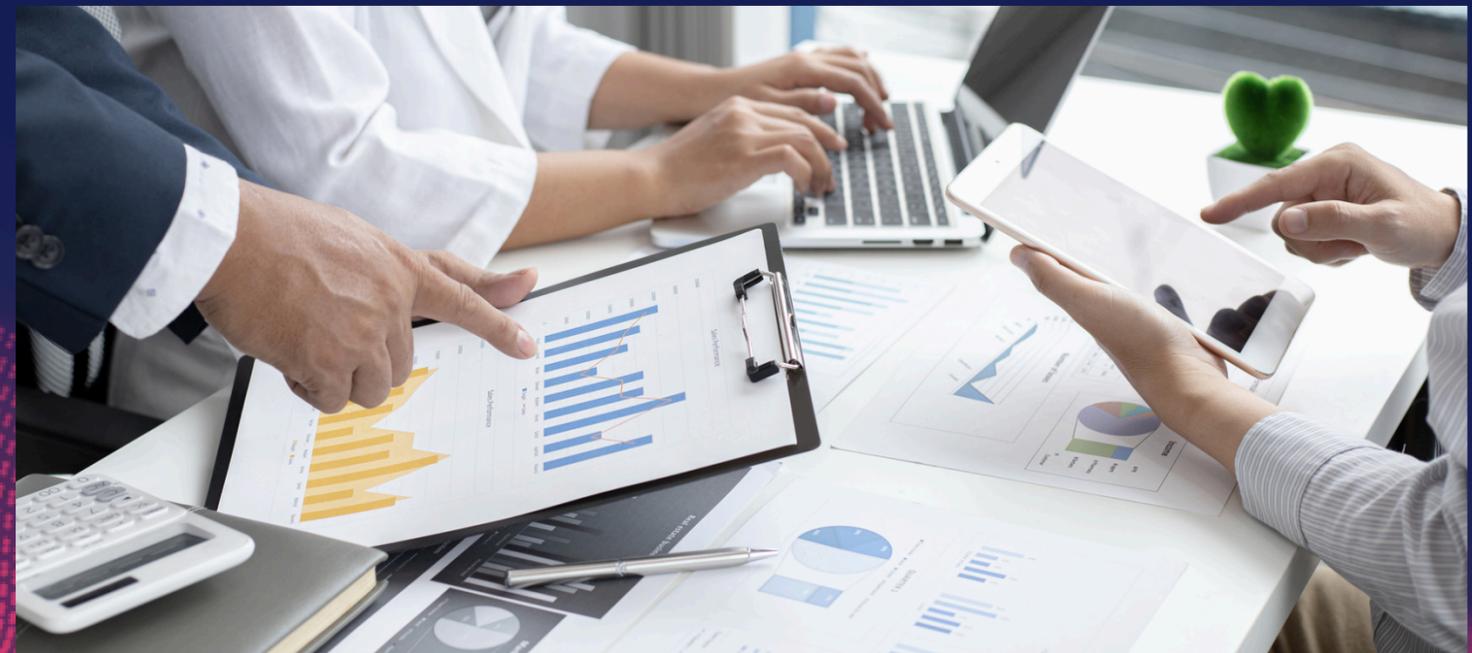
# EXAMPLE OF NEGATIVE FEEDBACK

Thyroid-stimulating hormone (TSH) released from pituitary gland stimulates thyroid gland to secrete thyroxine. When thyroxine level increases in blood, it inhibits the secretion of TSH from pituitary so that, the secretion of thyroxin from thyroid gland decreases. On the other hand, if thyroxine secretion is less, its low blood level induces pituitary gland to release TSH. Now, TSH stimulates thyroid gland to secrete thyroxine



# POSITIVE FEEDBACK MECHANISM

- Positive feedback is the one to which the system reacts in such a way as to increase the intensity of the change in the same direction.
- it has its own significance particularly during emergency conditions



# EXAMPLE OF POSITIVE FEEDBACK

- Blood clotting is necessary to arrest bleeding during injury and it occurs in three stages.
- The three stages are:
  - i. Formation of prothrombin activator
  - ii. Conversion of prothrombin into thrombin
  - iii. Conversion of fibrinogen into fibrin.
- Thrombin formed in the second stage stimulates the formation of more prothrombin activator in addition to converting fibrinogen into fibrin. It causes formation of more and more amount of prothrombin activator so that the blood clotting process is accelerated and blood loss is prevented quickly.

