



STD 10-FIRST BELL- BIOLOGY- CLASS-05

Chapter – 1  
Sensations and Responses

Generation and Transmission of impulses

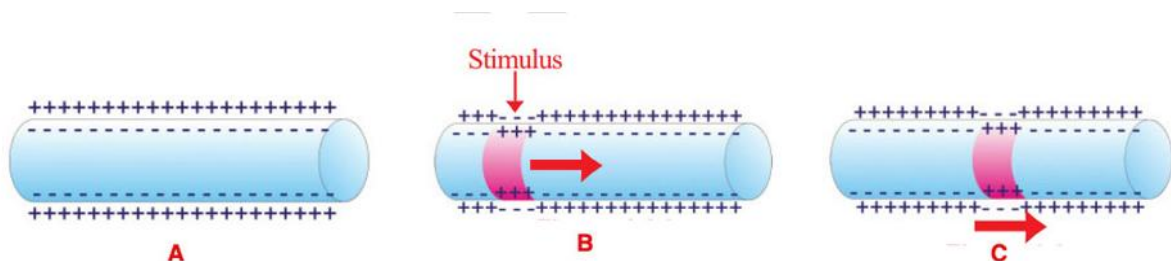
Ø: What are impulses?

- Nerve impulses are messages transmitted through the neurons.
- Impulses transmit in the form of electric charges.
- The nervous system manages control and coordination through nerve impulses.

Ø: Where are impulses generated?

- **Receptor cells**

Ø: How are impulses transmitted through neurons?



**A:** This is the condition of the neuron before **it receives stimulus**

- The plasma membrane of a resting neuron is electrically polarized. It is in a state of ionic equilibrium.
- There is positive charge on the outer surface and negative charge inside the plasma membrane of the neuron.
- The difference in the distribution of ions ( $K^+$  &  $Na^+$ ) helps to maintain positive charge on the outer surface and negative charge inside the plasma membrane of the neuron.

**B:** This is the condition when **stimulus is received**.

- When stimuli evoke changes in polarity in the plasma membrane of receptors, the Impulses are generated
- When a neuron stimulated, the ionic equilibrium in the particular part changes. As a result polarity changes and the outer surface becomes negatively charged while the inner surface becomes positively charged
- This change does not persist for long. It regains its original state.

**C:** Transmission of nerve impulse

- The momentary charge difference in the axon membrane stimulates its adjacent parts and similar changes occur there too. As this process continues, impulses get transmitted through axon.

Q: Charges on either side of the plasma membrane

Q: Change in the charges of ions when stimulated

Q: Transmission of nerve impulse

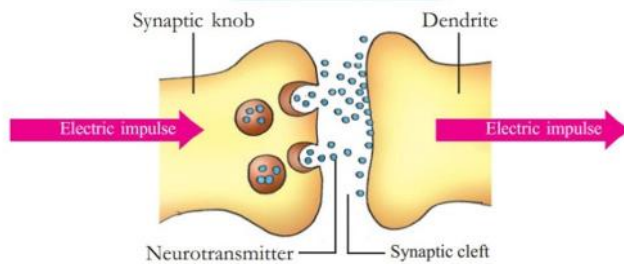
Ø: **What is reason for the formation of impulses?**

- Impulses **are generated when** stimuli evoke changes in polarity in the plasma membrane of receptors.

### Synapse

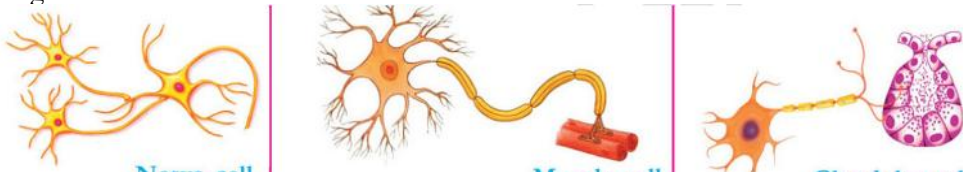
- Synapse is the junction between **two neurons** or **a neuron and a muscle cell** or **a neuron and a glandular cell**.

### Structure of synapse



### Different type of synapses

- One neuron joins with another neuron
- Neuron and muscle cell
- Neuron and gland cell



- There is no contact between the two parts at the junction.

### Importance of synapse

- Helps to regulate the speed and direction of impulses.

### Synaptic cleft

- The cleft between synaptic knob and dendrite is called synaptic cleft.

### Impulse transmission through synapse

- When electric impulses from axon reach the **synaptic knob** a **neuro transmitter** (eg. Acetyl choline, dopamine) is secreted into the synaptic cleft.
- The neurotransmitter stimulate adjacent the adjacent dendrite or cell and new electric impulses are generated

Ø: **How do impulses get transmitted through synaptic cleft?**

### Neurotransmitter.

- The chemical substance secreted from the synaptic knob.
- Help to transmit the impulses to the adjacent cells through the synaptic cleft
- **Acetylcholine** and **dopamine** are examples of neurotransmitters.

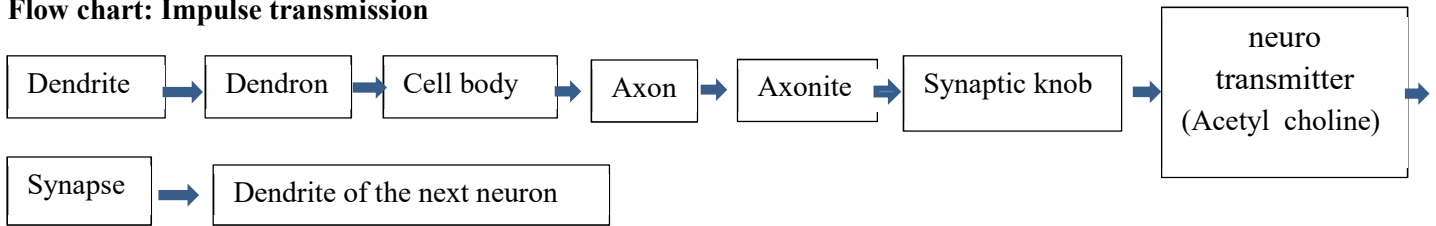
### Function of neurotransmitter

- Stimulates the adjacent dendrite and create new electric impulse

### Transmission of impulses

- Impulses generated in the receptor cells have to reach the brain or spinal cord.
- For this purpose, the receptors transmit impulses to other neurons and associated cells.
- When impulses reach the brain, the brain analyses them and sends appropriate direction to the muscles or glands. Then responses occur.

**Flow chart: Impulse transmission**



**Different types of Neuron**

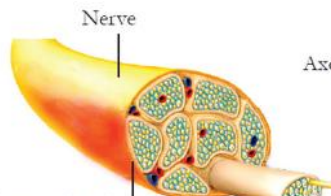
- Based on the **direction of impulses**, neurons can be classified into **sensory neurons** and **motor neurons**.

<b>Sensory neurons</b>	▪ Sensory neurons carry impulses to the brain and spinal cord
<b>Motor neurons</b>	▪ Motor neurons carry impulses from the brain and spinal cord to various parts of the body

**Nerves**

- A groups of axons or nerve fibres covered by connective tissue constitutes a nerve
- Nerve carries the impulses or messages from one part of the body to another part.**

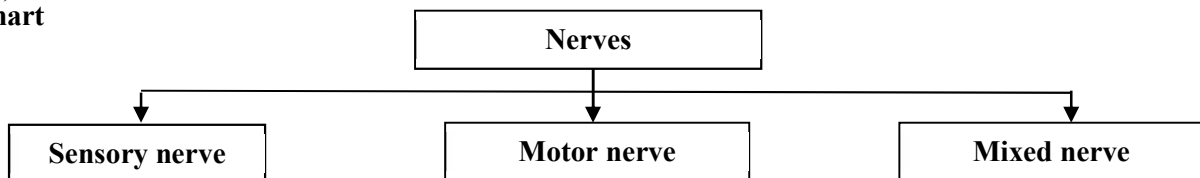
**Cross section of nerve**



- On the basis of **their functions**, nerves are further classified in to three. They are sensory nerve, motor nerve, mixed nerve

<b>Nerves and their peculiarities</b>	<b>Functions</b>
(Afferent nerve) (formed of sensory nerve fibres)	Carries impulses from various parts of the body to the brain and the spinal cord.
<b>Motor nerve</b> (Efferent nerve) (formed of motor nerve fibres)	Carries impulses from brain and spinal cord to various parts of the body
<b>Mixed nerve</b> (formed of sensory nerve fibres and motor nerve fibres)	Carries impulses to and from the brain and spinal cord.

**Flow chart**



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