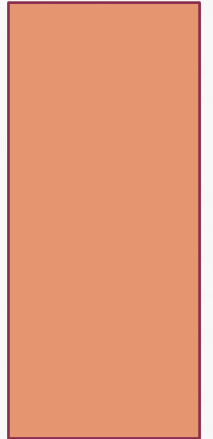


NERVE FIBER

DR D S JANKAR



OBJECTIVES

- Classification of nerve fibers: based on structure, diameter, functions and only for sensory nerves.
- Properties of nerve fibers.
- Strength duration curve: chronaxie and factors affecting it.
- Factors affecting conduction in a nerve.

INTRODUCTION

- Nerve fiber?
- Nerve Tract
- Peripheral nerve

NEURONAL INJURY

- **Causes:-**
- **Principles of neuronal response to injury:-**
 - If cell body damaged, the neuron dies, and is not replaced by cell division in mature brain.
 - If the axon is damaged or severed at a distance from the soma, there is a good chance of regeneration, primarily in the PNS.

NEURONAL INJURY

- **Injury to nerve cell body :-**
- **Injury to Axon:-**
 - 1) Wallerian degeneration**
 - 2) Retrograde degeneration**
 - 3) Retrograde transneuronal degeneration**
 - 4) Anterograde transneuronal degeneration**

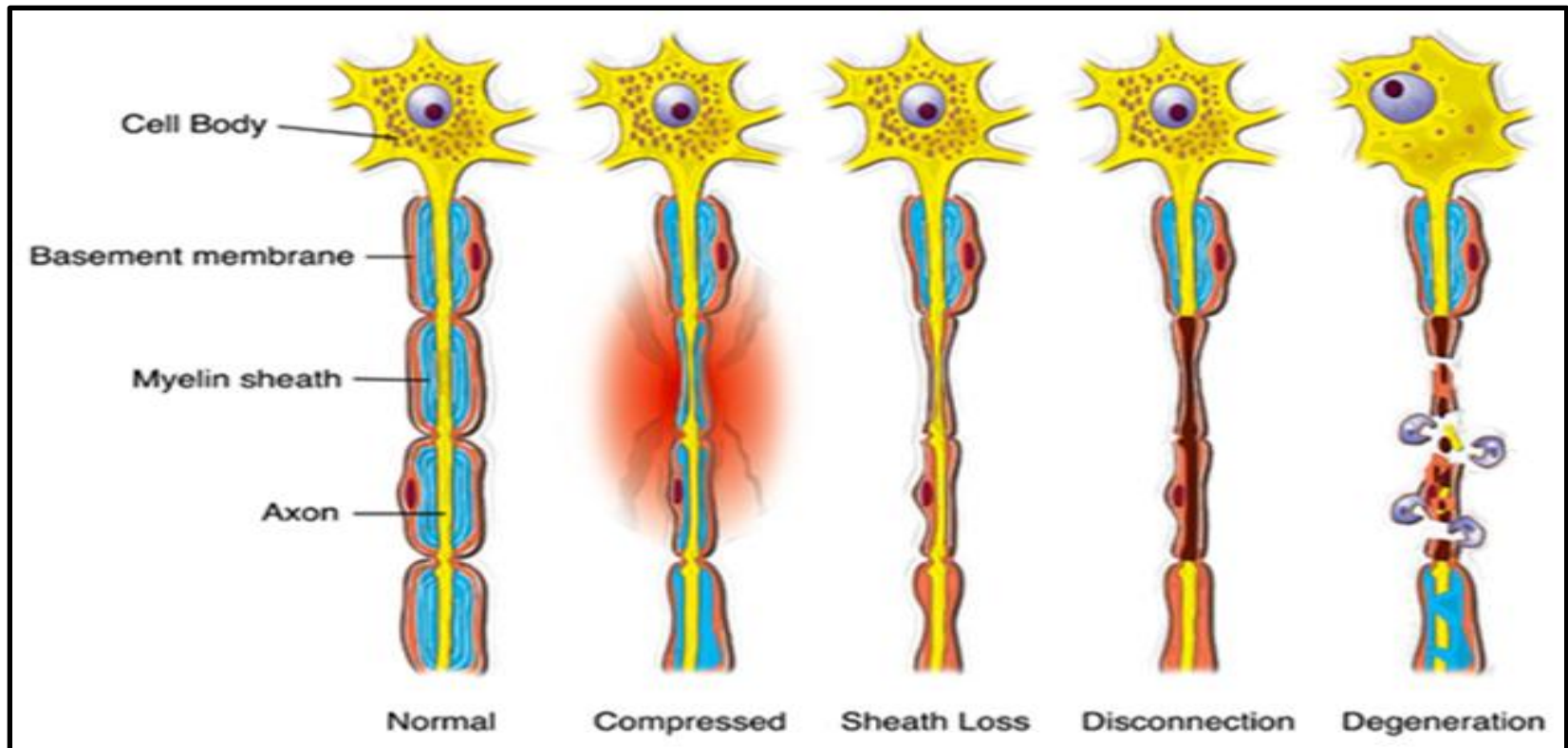
INJURY TO AXON

1) Wallerian degeneration:-

- a. Degeneration of pre-synaptic terminal**
- b. Degeneration of distal segment**
- c. Myelin degeneration**
- d. Scavanging of debris**

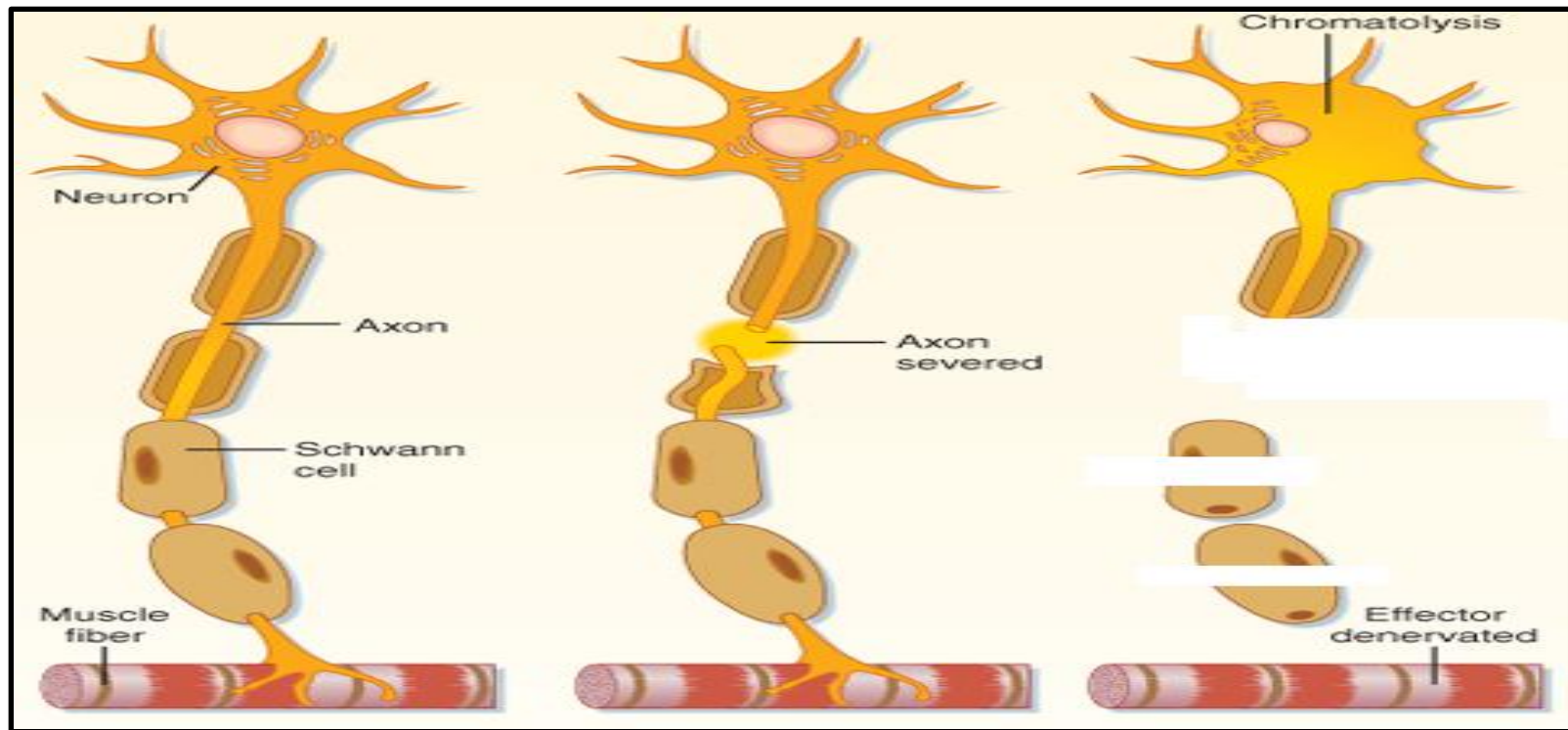
INJURY TO AXON

1) Wallerian degeneration:-



INJURY TO AXON

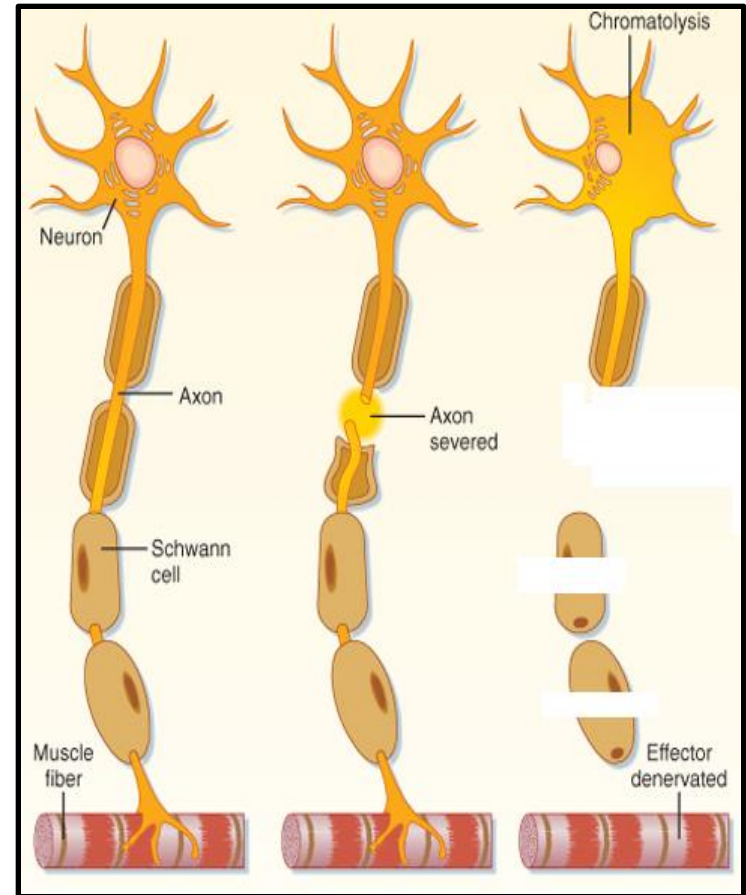
1) Wallerian degeneration:-



INJURY TO AXON

2) Retrograde degeneration:-

- a. Changes in Proximal segment
- b. Changes in nerve cell body
 - **Chromatolysis**



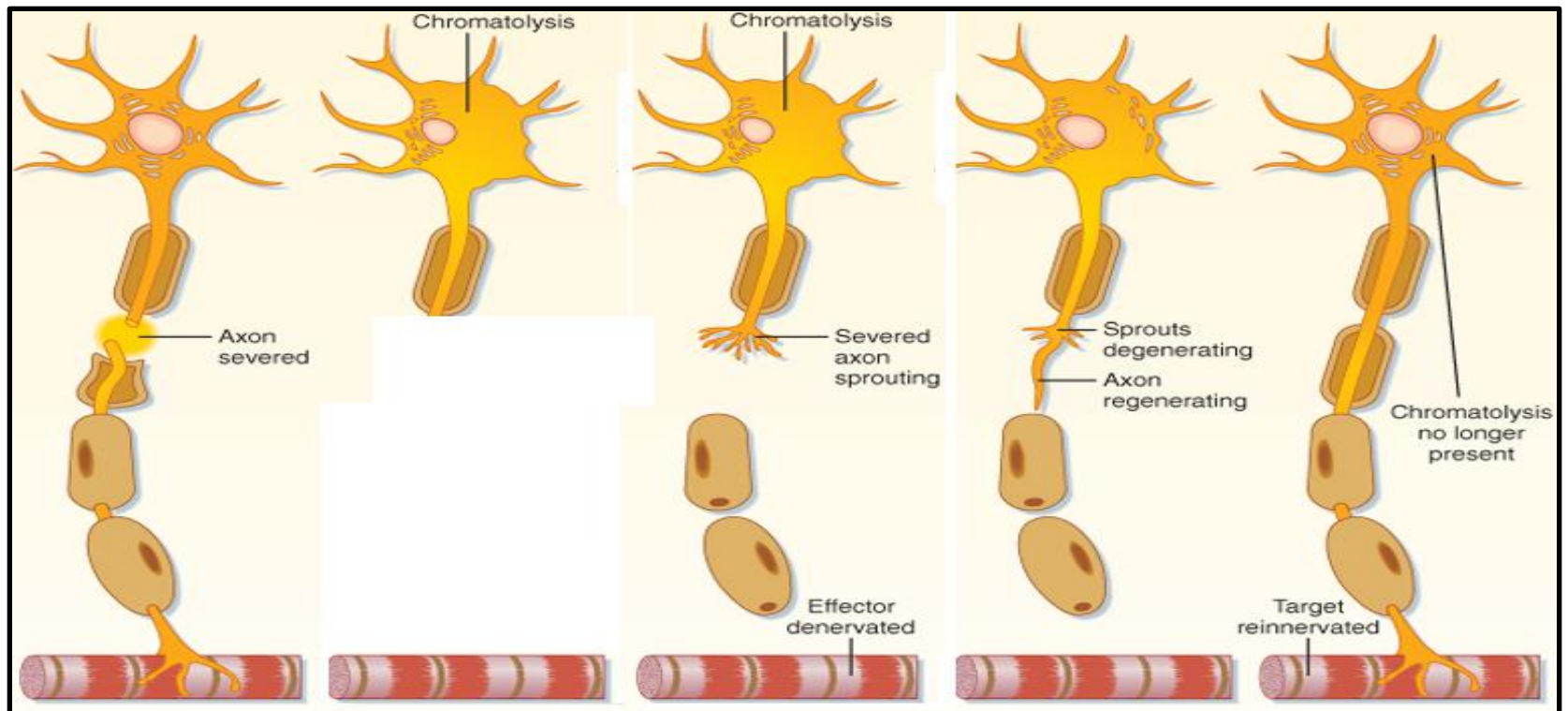
NEURONAL INJURY

- 3) Retrograde transneuronal degeneration**
- 4) Anterograde transneuronal degeneration**

NEURONAL RECOVERY

1) Recovery of Nerve Cell Body:-

2) Regeneration of Axons in PNS:-



NEURONAL RECOVERY

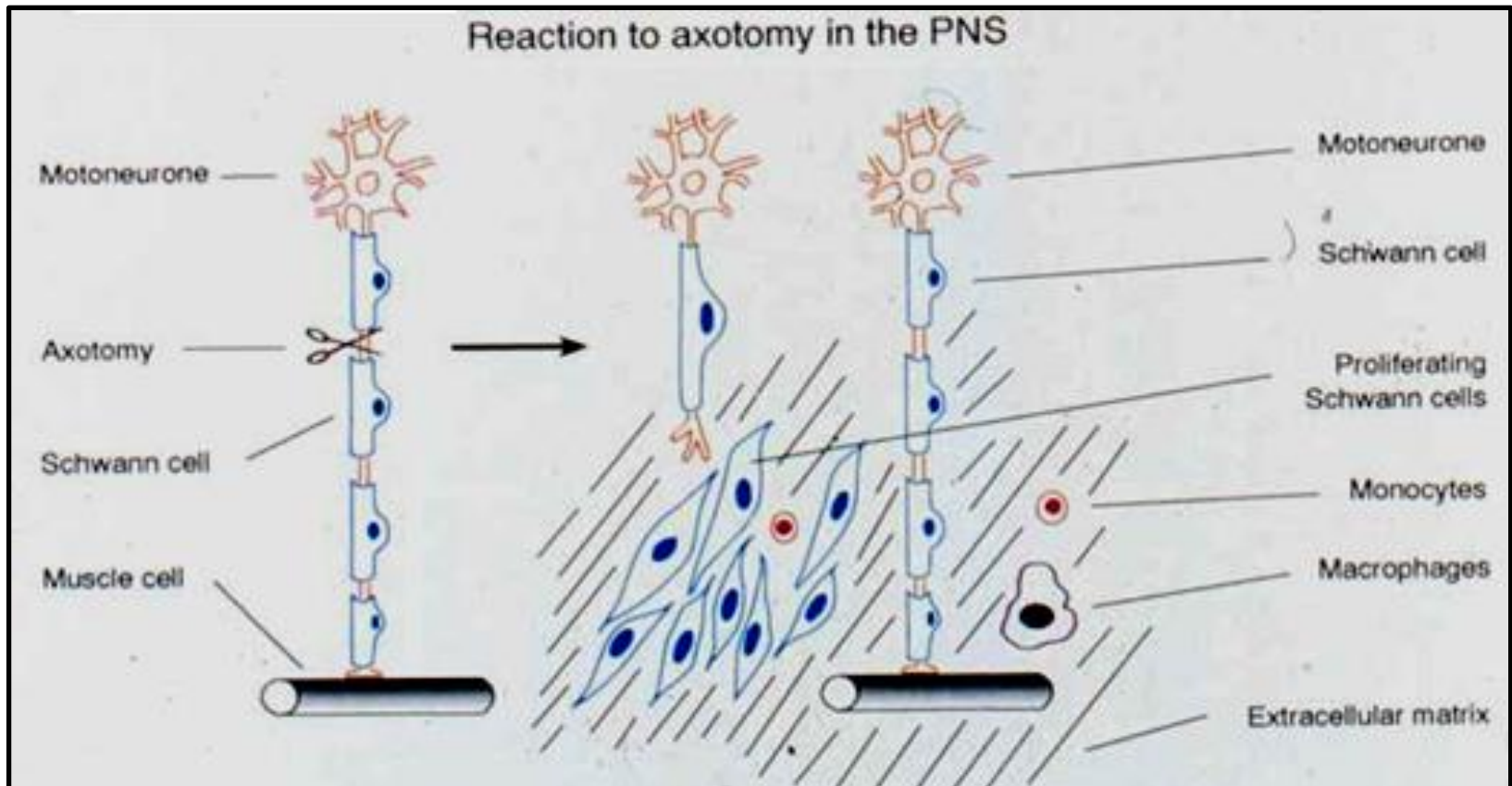
3) Axons in CNS DO NOT Regenerate:-

CNS axons can regrow, but...

- Oligodendrocytes do not form path for growing axon
- Myelin proteins inhibit axonal growth
- Lack of chemical signals
- Astrocytes form glial scar

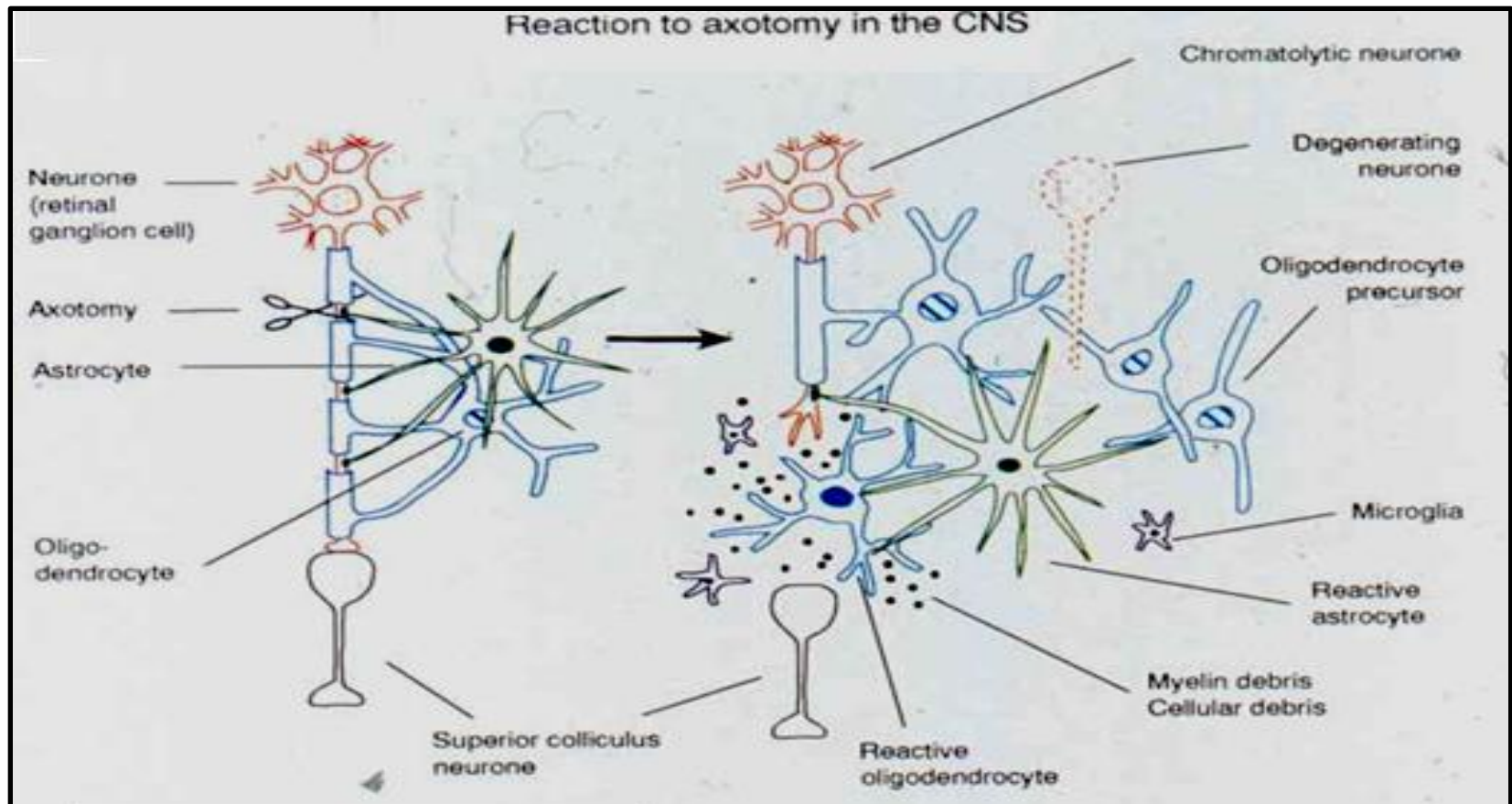
NEURONAL RECOVERY

3) Axons in CNS DO NOT Regenerate:-



NEURONAL RECOVERY

3) Axons in CNS DO NOT Regenerate:-



NEURONAL RECOVERY

Seddon's Classification of neuronal injury:-

- based on three main types of nerve fiber injury and whether there is continuity of the nerve
 1. Neuropraxia
 2. Axonotmesis
 3. Neurotmesis

Neurapraxia

no axonal discontinuity

Axonotmesis

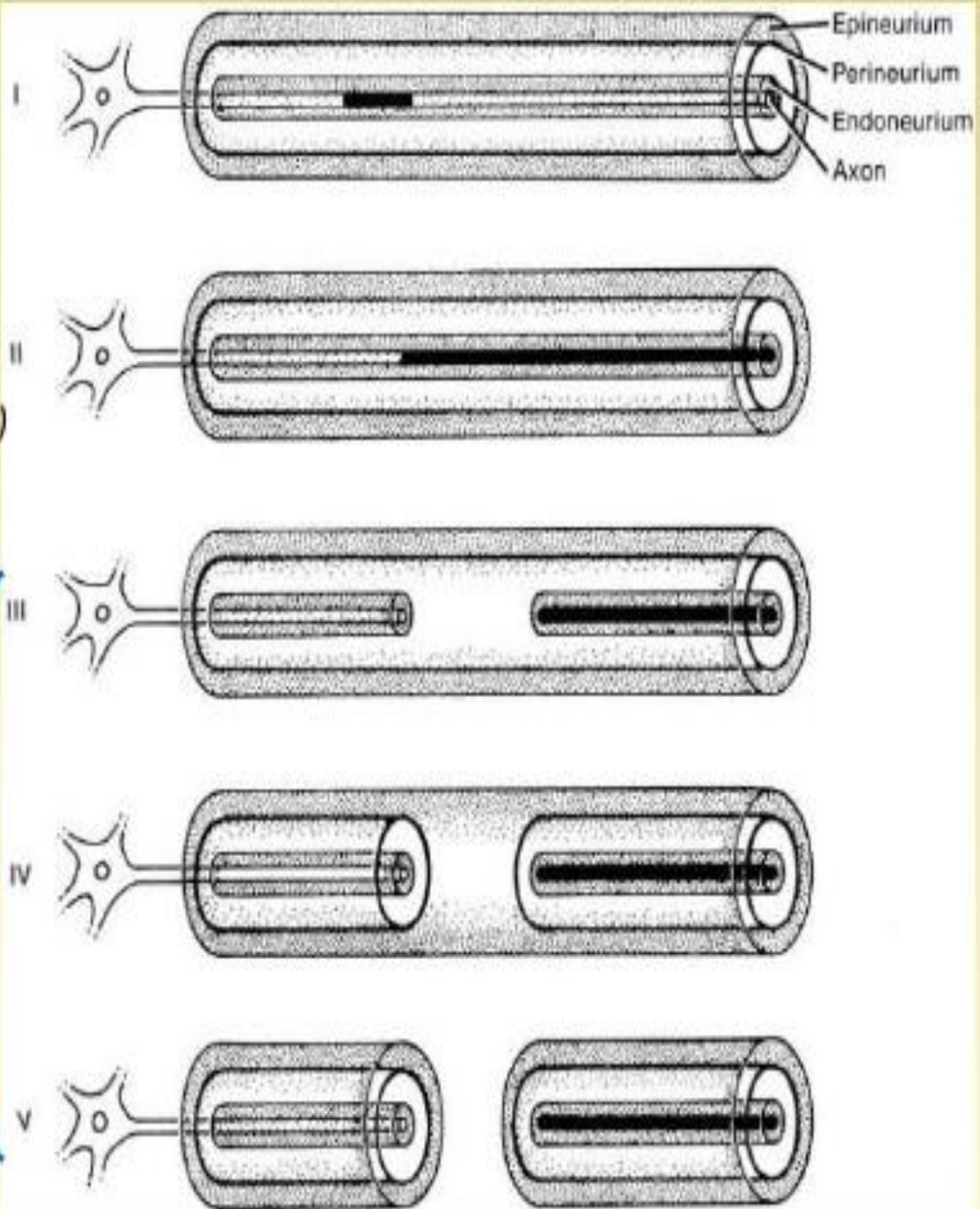
Wallerian degeneration (distal to lesion)

Axoplasmic disruption, endoneurial sheaths intact

Neurotmesis

Wallerian degeneration (distal to lesion)

Axon disrupted, loss of tubules, support cells destroyed



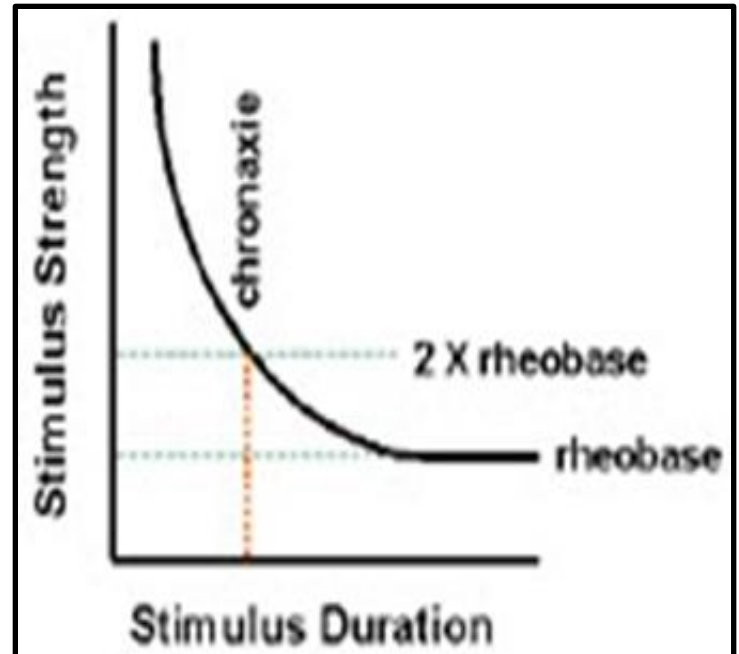
NEURONAL INJURY

Methods of Functional Assessment of Nerve Injury:-

- 1) Strength-Duration curve
- 2) Assessment of Sensory nerve function
- 3) Assessment of Motor nerve function
- 4) Autonomic function tests
- 5) Nerve conduction study

STRENGTH-DURATION CURVE

- Procedure:-
- Strength-Duration curve:-
 - a. Rheobase:-
 - Rheo means stimulus strength
 - base means foundation
 - The minimum stimulus strength that produces a response is called Rheobase

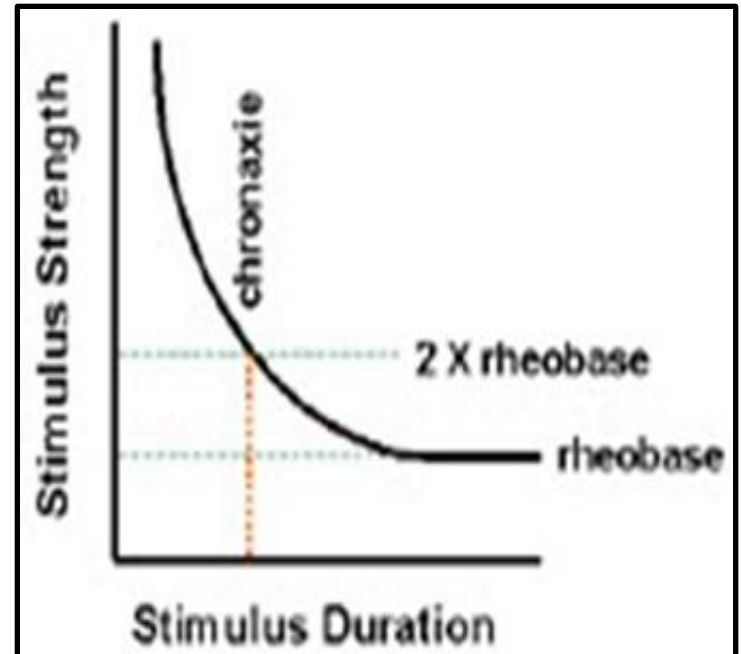


STRENGTH-DURATION CURVE

- Strength-Duration curve:-

- b. Chronaxie :-

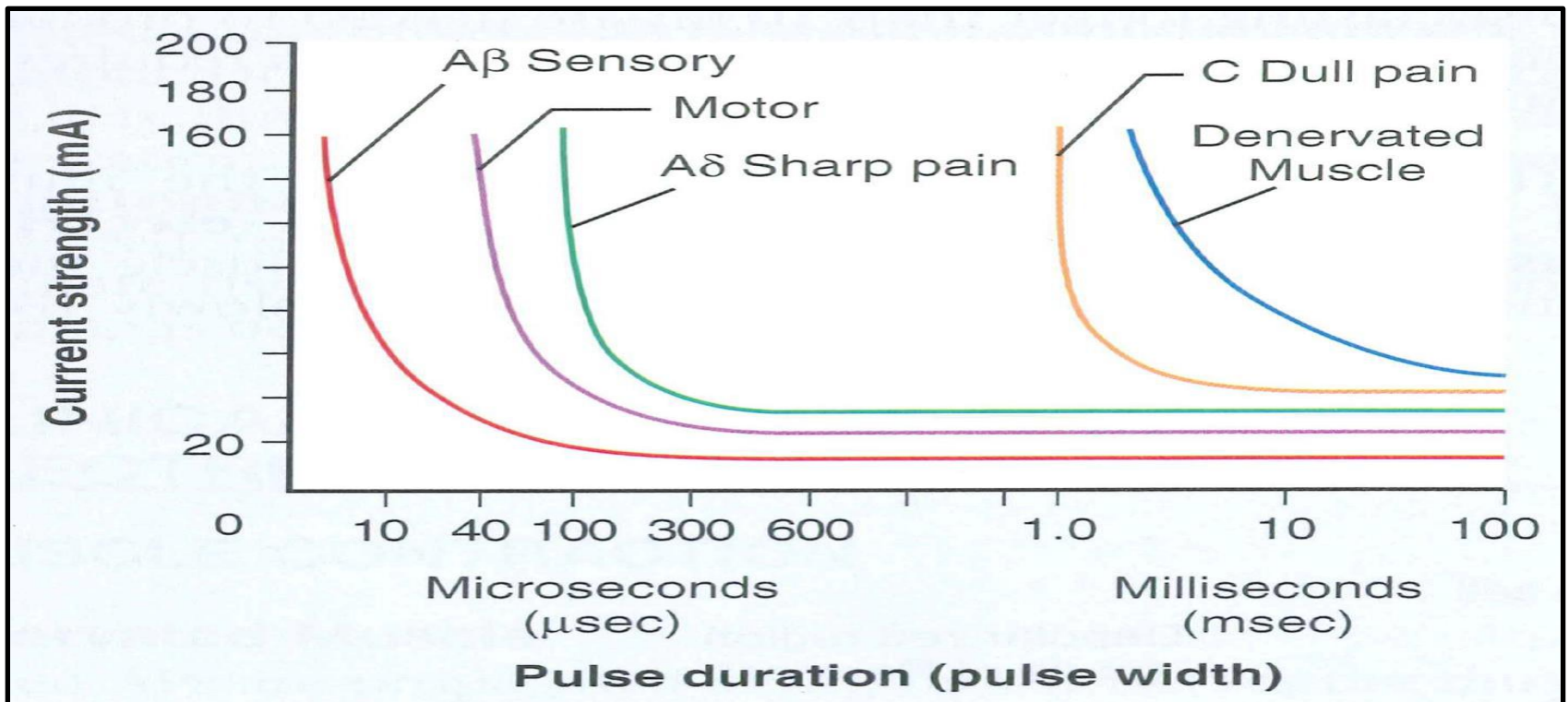
- Chron means time
 - axie means axis



- It is the duration for which a stimulus twice the strength of rheobase needs to be applied to elicit response

STRENGTH-DURATION CURVE

- Strength-Duration curve:-



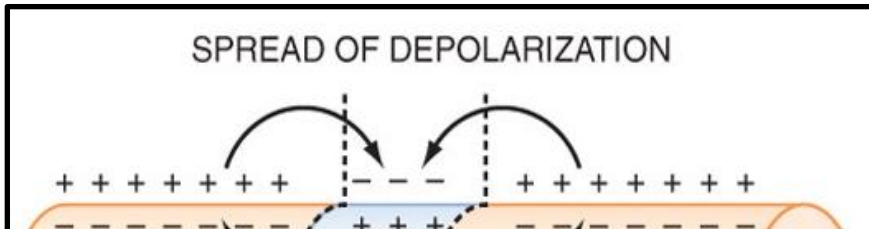
PROPERTIES OF NERVE FIBER

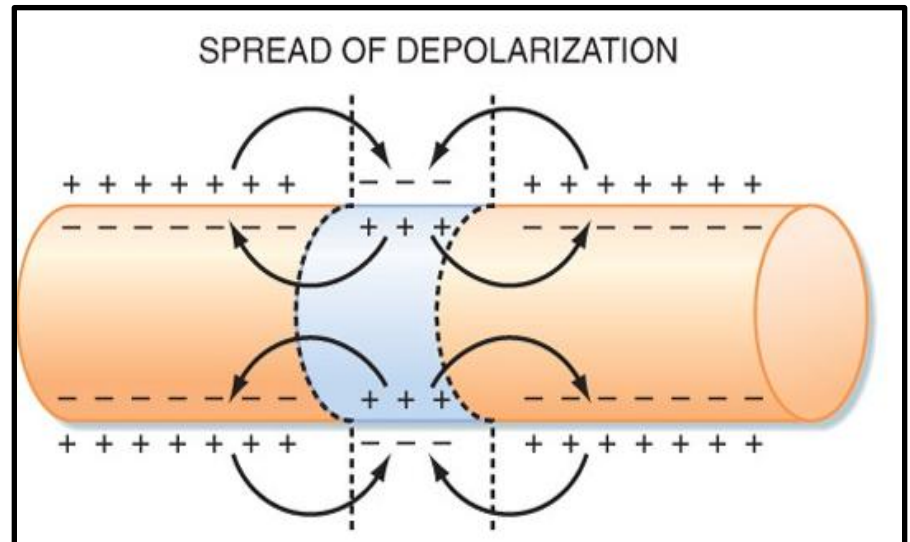
I] Excitability:-

- It is the ability of generating electrochemical impulse (AP) at the cell membrane in response to any stimulus.
- Excited by negatively charged electrode
- Hyperpolarized by positively charged electrode

PROPERTIES OF NERVE FIBER

II] Conductivity:-

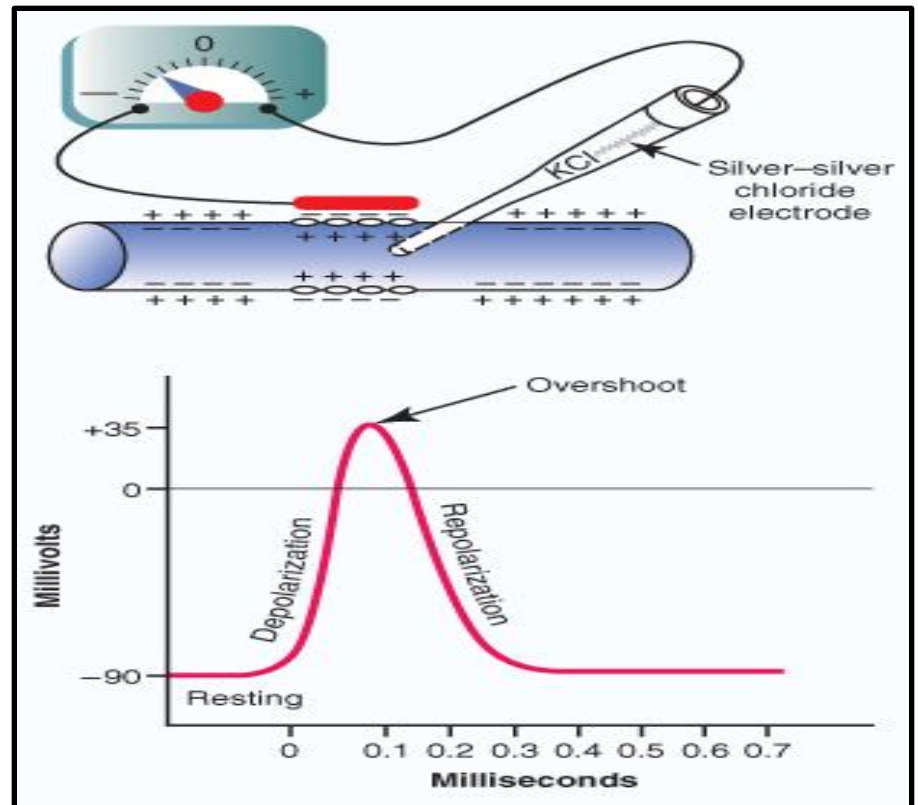
- It is the ability to propagate action potential from the point of generation to the rest of the membrane.
- 1) Orthodromic conduction
 - 2) Antidromic conduction
- 
- The diagram, titled "SPREAD OF DEPOLARIZATION", illustrates the propagation of an action potential along a cell membrane. The membrane is represented by a horizontal line with a central region of depolarization (blue) and two regions of hyperpolarization (orange). Arrows indicate the spread of depolarization from the central region to the hyperpolarized regions. The membrane is labeled with positive charges (+) and negative charges (-).



PROPERTIES OF NERVE FIBER

III] Electrotonic & Action Potential:-

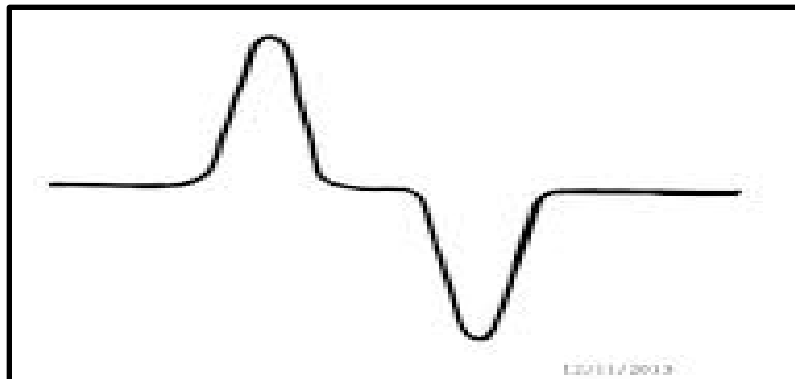
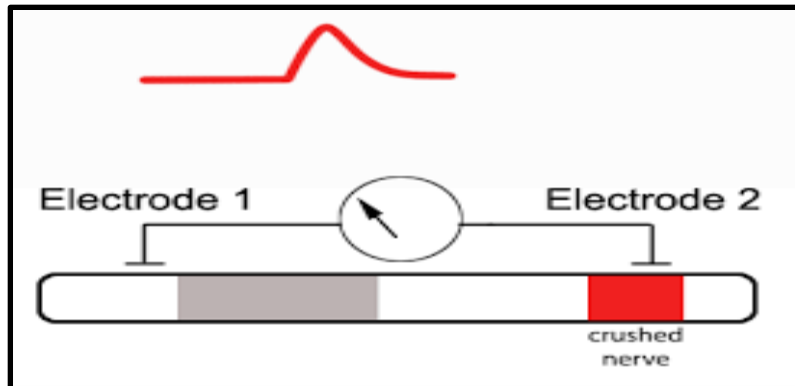
- 1) RMP
- 2) Electrotonic potential
- 3) Monophasic AP



PROPERTIES OF NERVE FIBER

III] Electrotonic & Action Potential:-

- 1) RMP
- 2) Electrotonic potential
- 3) Monophasic AP
- 4) Biphasic AP
- 5) Compound AP



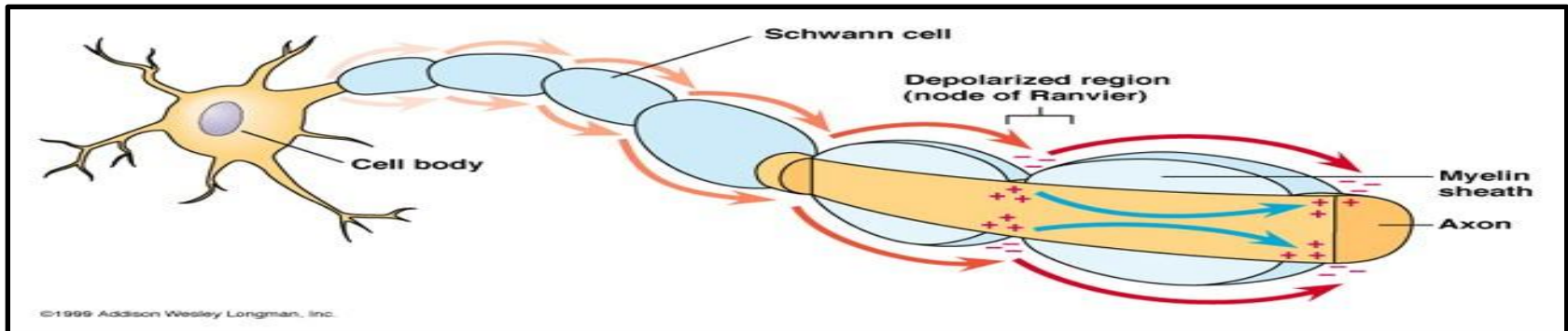
PROPERTIES OF NERVE FIBER

IV] All or None Law:-

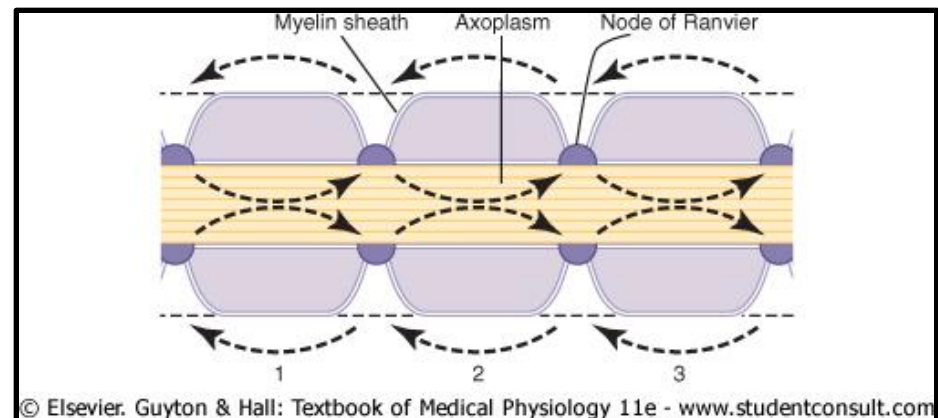
V] Adaptation:-

PROPERTIES OF NERVE FIBER

VI] Saltatory conduction:-



- Cause:-
- Importance:-



PROPERTIES OF NERVE FIBER

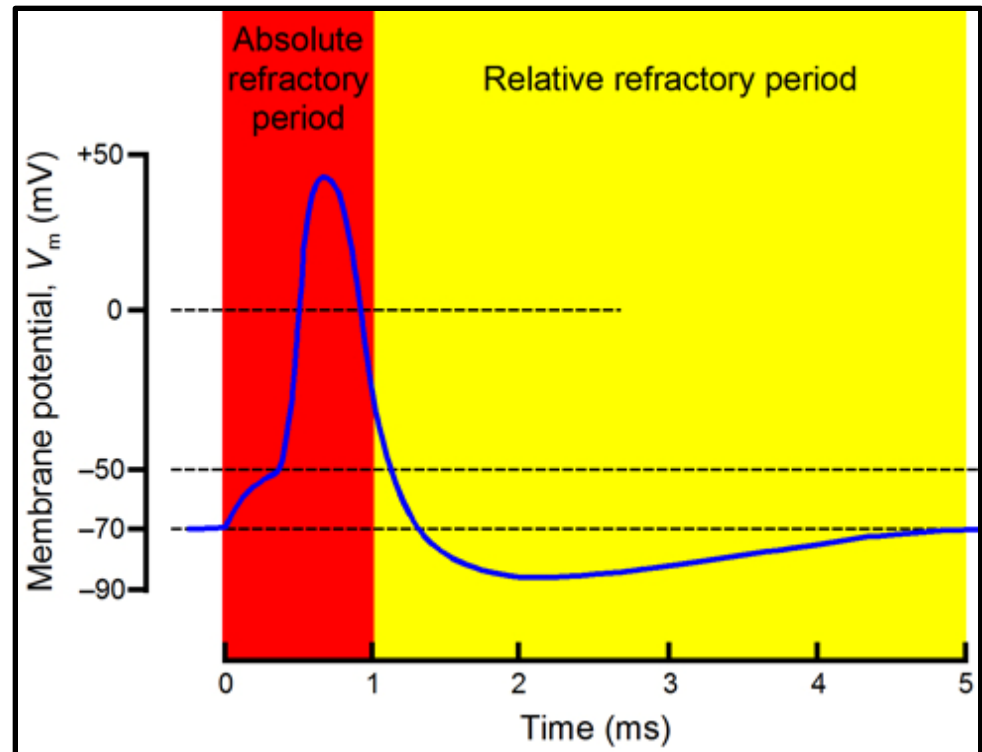
VII] Refractory Period:-

1) Absolute

- cause

1) Relative

- cause



presence of calcium on nerve membrane may play a significant role in

- A. operation of sodium pump
- B. regulation of potassium outflow
- C. keeping sodium gates closed
- D. preventing protein anions from going out

All or none response in a nerve is applicable to

- A. A mixed nerve
- B. Only a sensory nerve
- C. Only a motor nerve
- D. A single nerve fibre

Accommodation in a nerve is

- A. Decrease of excitability to constant stimulation
- B. Rise in threshold during stimulation
- C. Due to slow opening of K channels
- D. All of the above

First change to occur in the distal segment of cut nerves

- A. Myelin sheath degeneration
- B. Axonal degeneration
- C. Mitosis of schwann cell
- D. Axonal sprouting

Following injury to a nerve, regeneration changes in the nerve cell body begins in

- A. 10 days
- B. 20 days
- C. 30 days
- D. 40 days

Wallerian degeneration refers to

- A. Degenerative and regenerative changes in a cut nerve fibre
- B. Retrograde degeneration of the axon upto the cell body
- C. Degenerative changes in the distal part of cut nerve fibre
- D. Degenerative changes at the site of injury

not true of refractory period in a nerve

- A. it is length of it remains non responsive to restimulation
- B. increase with diameter of nerve fibre
- C. it puts a limit to the frequency at which a nerve conduct impulses
- D. because of it a nerve can conduct maximum of 1000 impulses/sec

THE REST OF YOUR LIFE...

AVERAGE

MEMORABLE

CHOICE IS YOURS



**Thank
You!!!**