كلية الطب البشري
Faculty of Medicine

CNS Module-2021

Physiology Lectures
(Lecture 1)
Topic 1: Introduction

Synaptic transmission and neuronal pools

Presented by:

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Associate Professor of Medical Physiology

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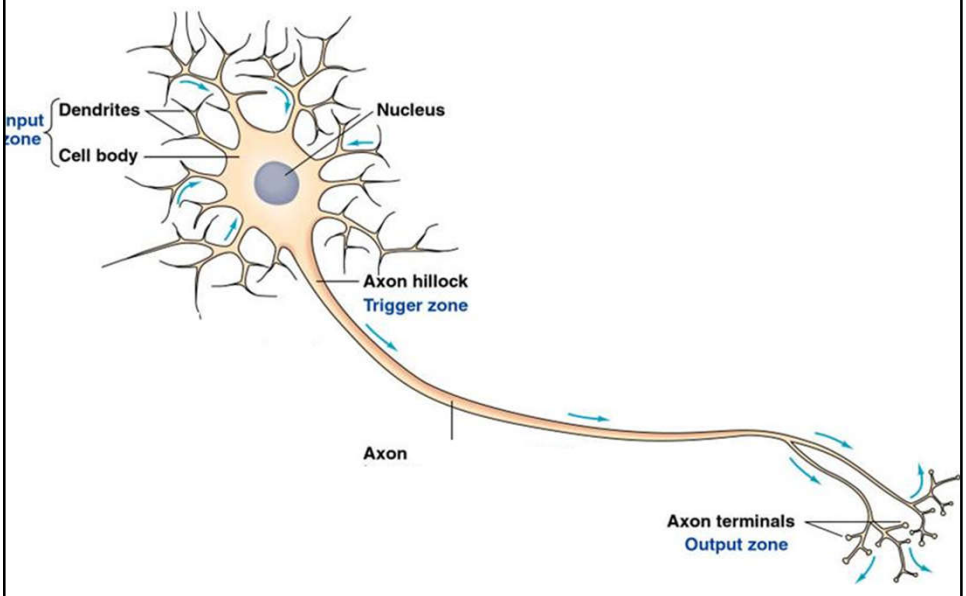

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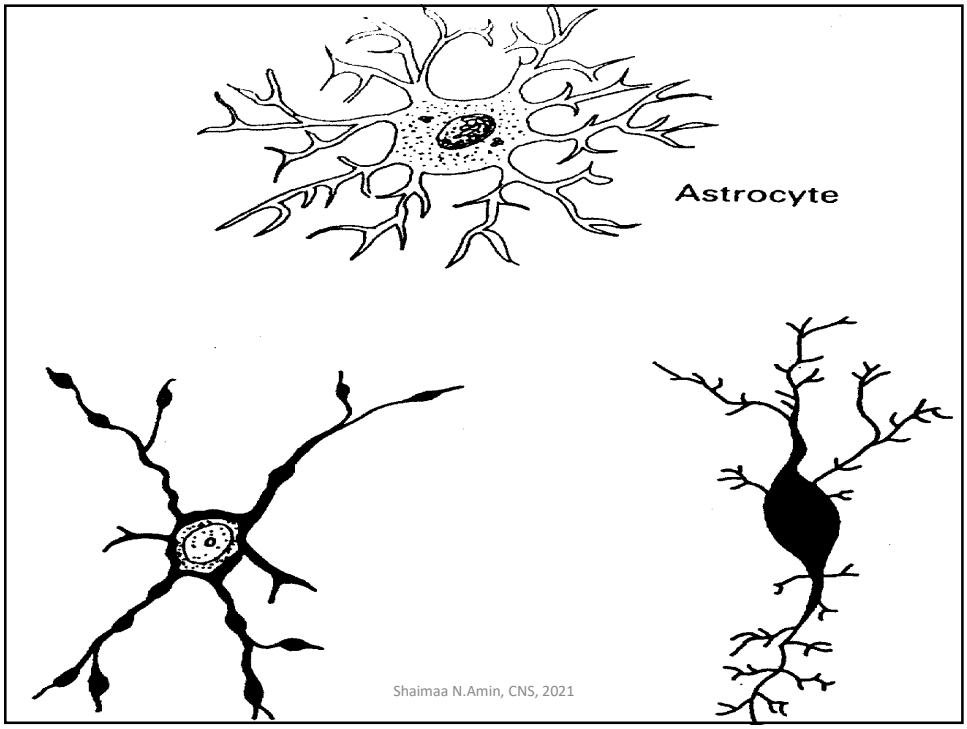
Astrocyte
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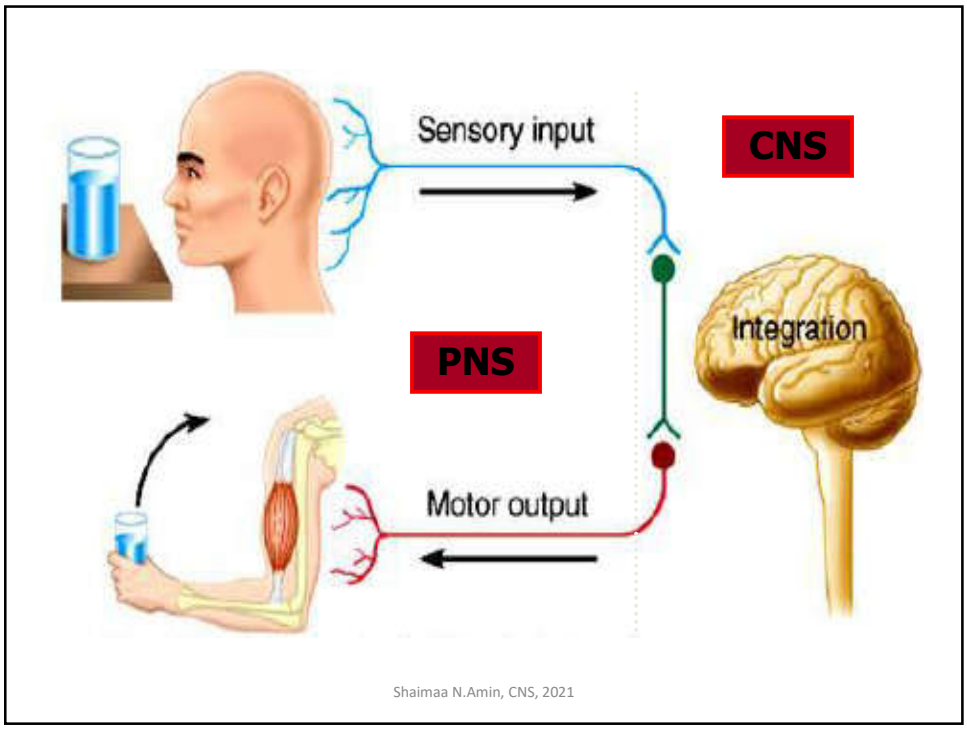
Sensory input
CNS
Integration
PNS
Motor output
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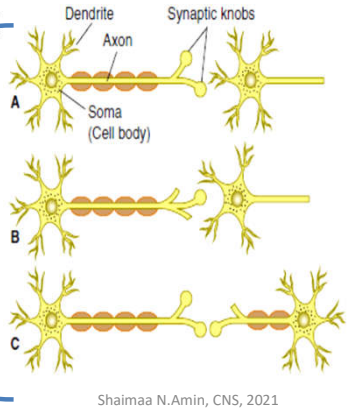
What is a synapse?

- Is a junction between an axon terminal of one neuron (presynaptic neuron) and a second neuron (postsynaptic

Anatomical Classification



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Synaptic transmission

- Transmission of an impulse (A.P.) from one neuron to another.
- **Physiological Types of S.T.**

1. Electric transmission.
2. Chemical transmission.

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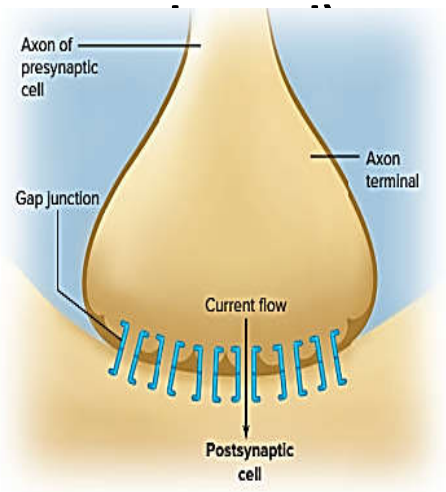
Electrical Transmission (Gap



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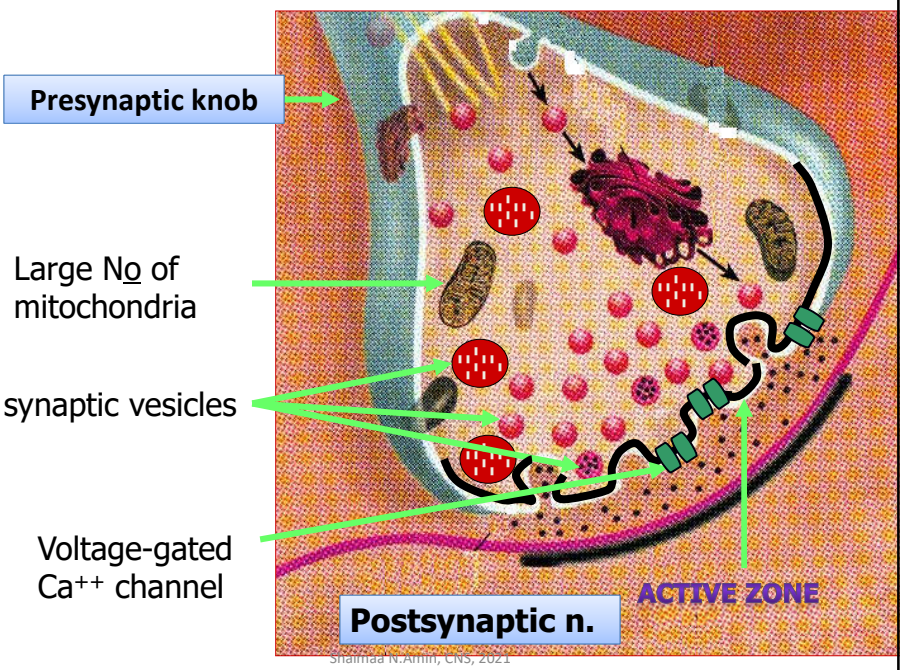

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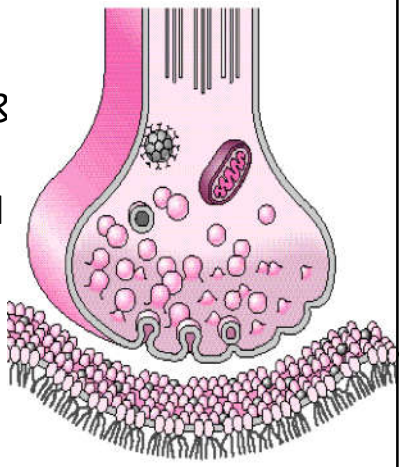
Functional anatomy of a synapse

1. Presynaptic terminal (presynaptic knob)

2. Synaptic cleft a space between the presynaptic & postsynaptic neurons contains extracellular fluid

3. postsynaptic membrane contains the receptors of the N.T.



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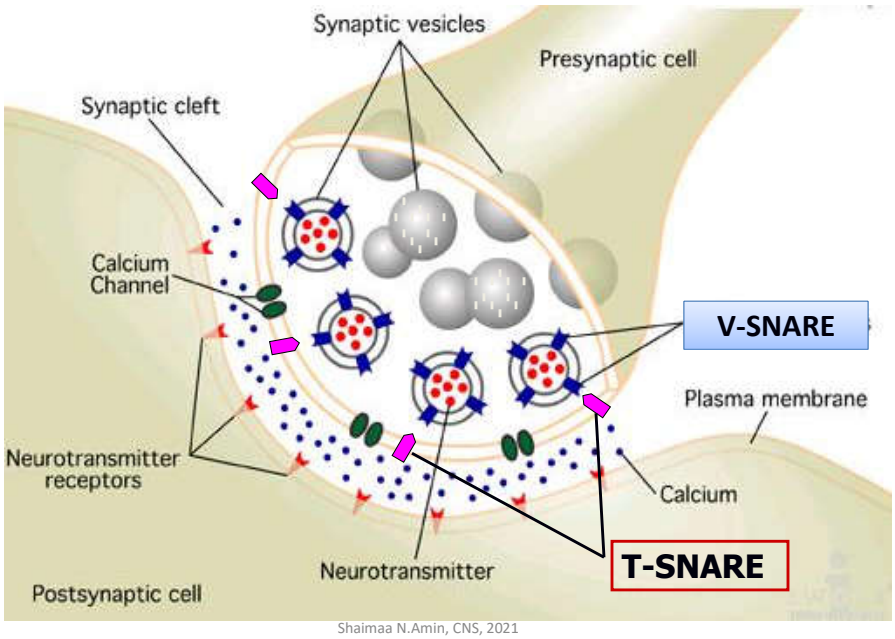

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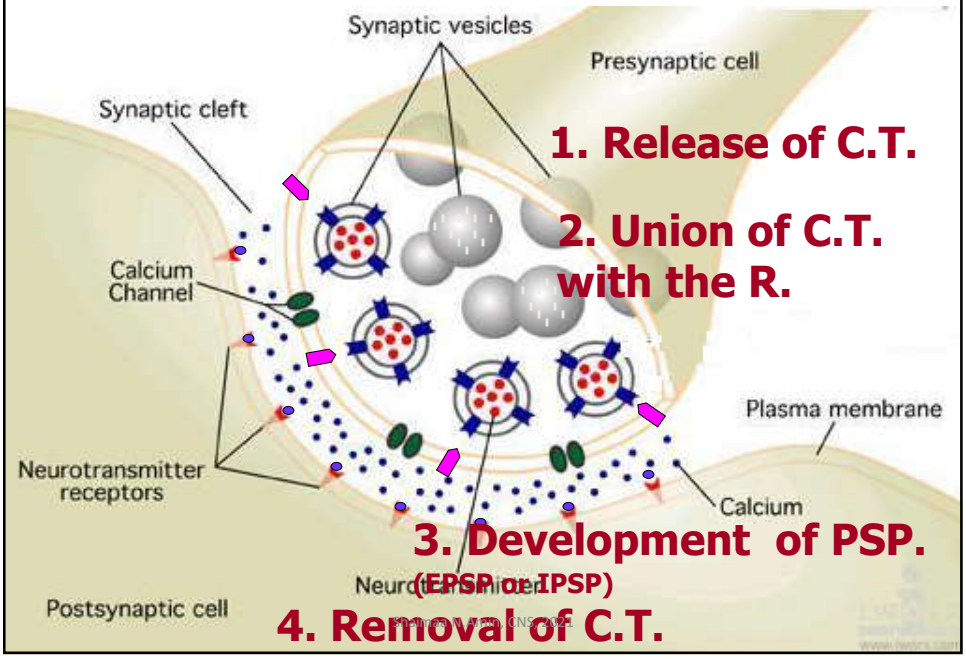
Mechanism of synaptic transmission



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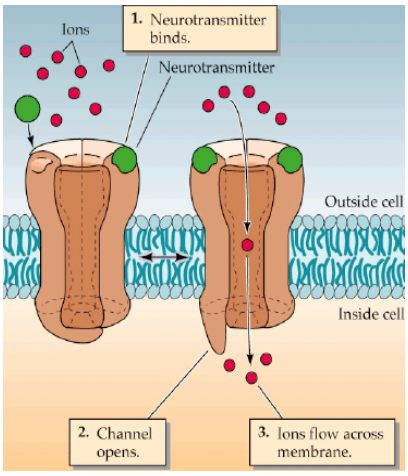
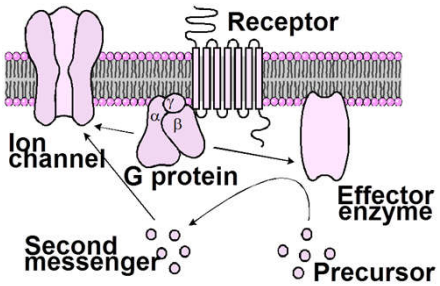
Types of receptors





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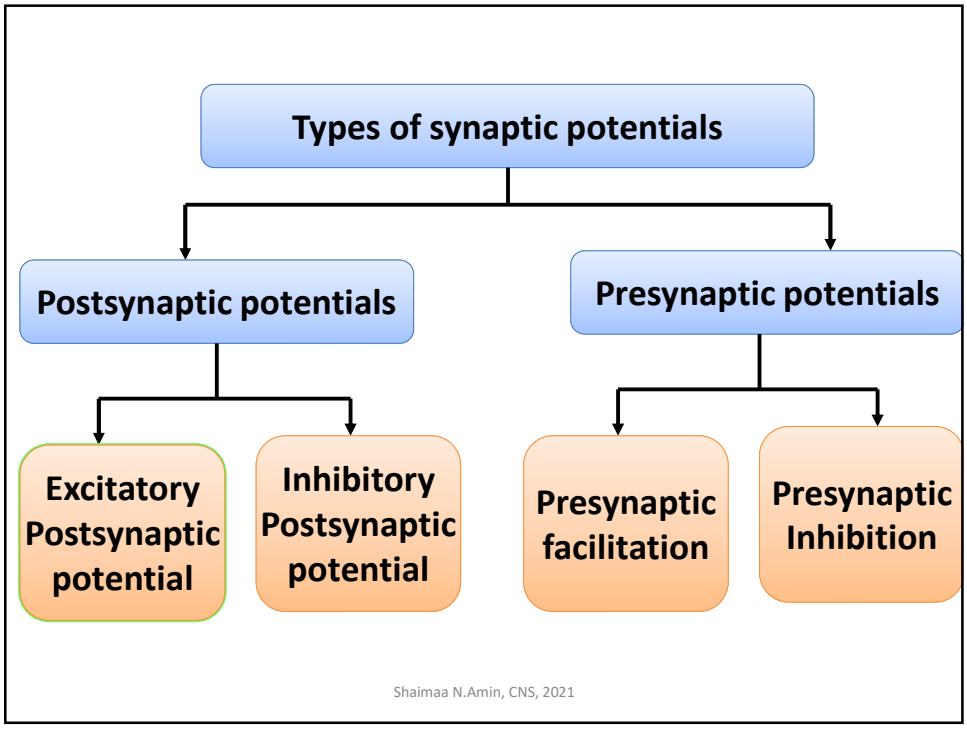
Types of synaptic potentials
Postsynaptic potentials
Presynaptic potentials
Excitatory Postsynaptic potential
Inhibitory Postsynaptic potential
Presynaptic facilitation
Presynaptic Inhibition
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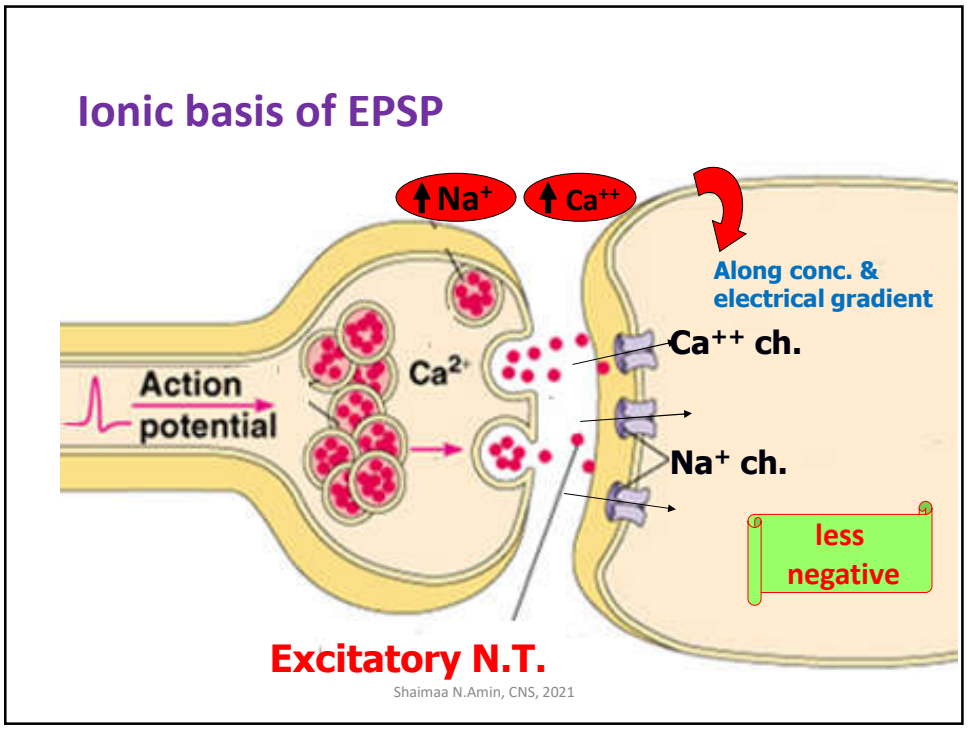
Ionic basis of EPSP
Na+
Ca++
Along conc. & electrical gradient
Ca++ ch.
Ca2+
Action potential
Na+ ch.
less negative
Excitatory N.T.
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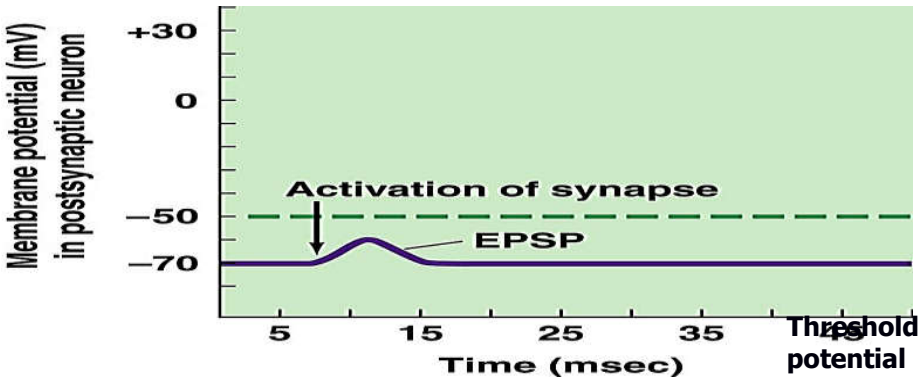
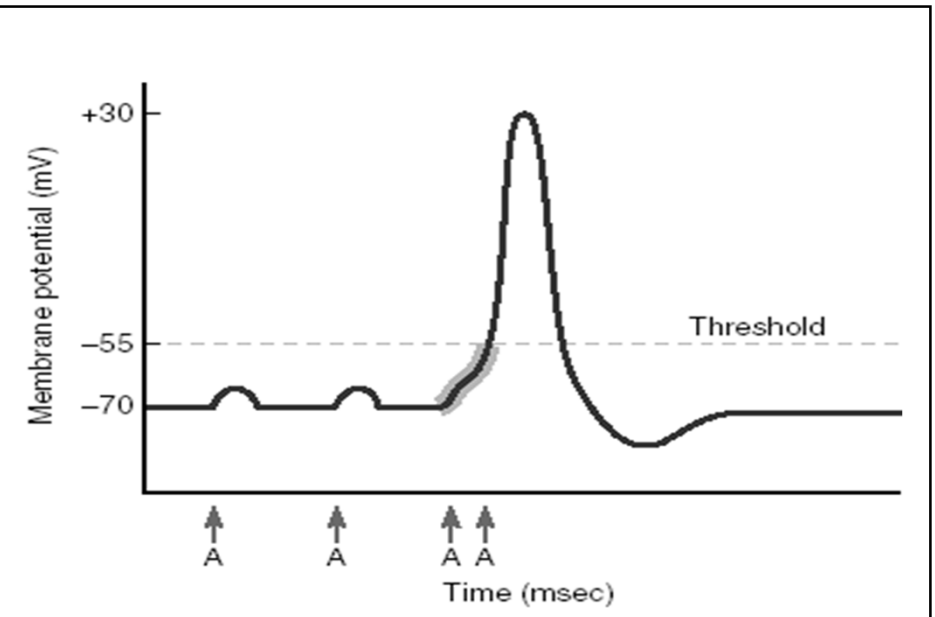
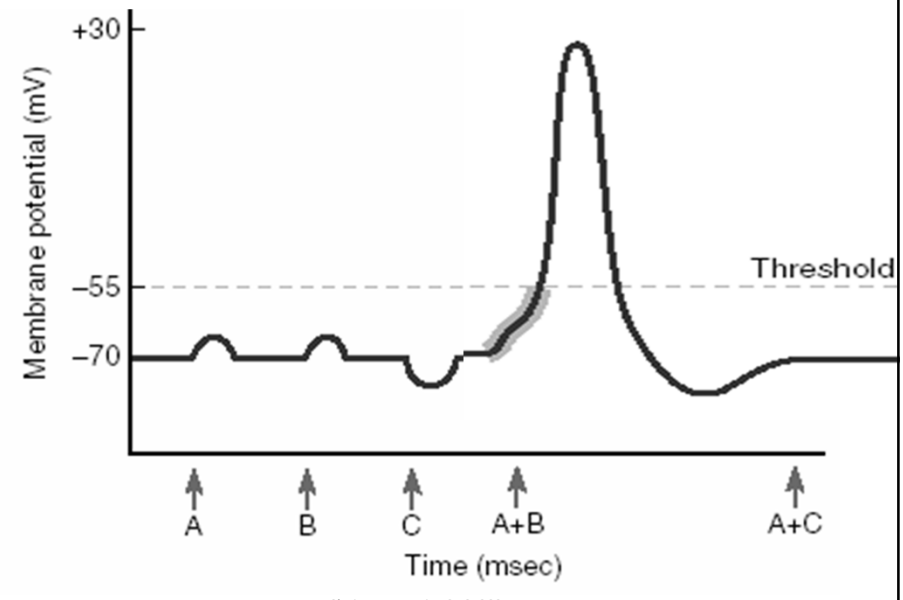

Membrane potential (mV)
in postsynaptic neuron
+30
0
−50
−70
Activation of synapse
EPSP
5
15
25
35
45
Time (msec)
Threshold
potential

15


+30
Membrane potential (mV)
−55
−70
Threshold
A
A
A
A
Time (msec)

16



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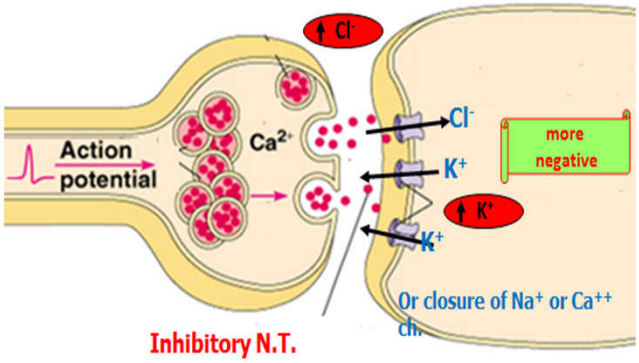
Inhibitory postsynaptic potential (IPSP)

It is a local state of slight hyper-polarization in postsynaptic memb.



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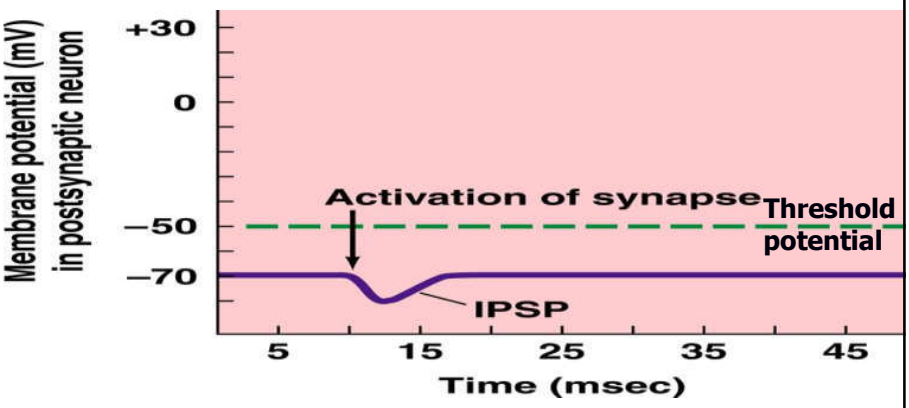

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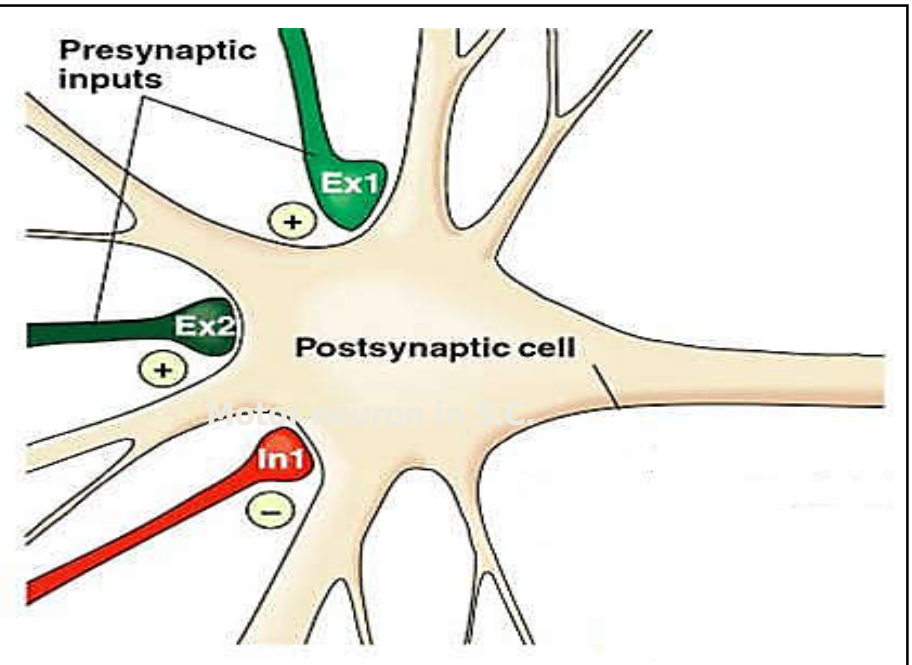

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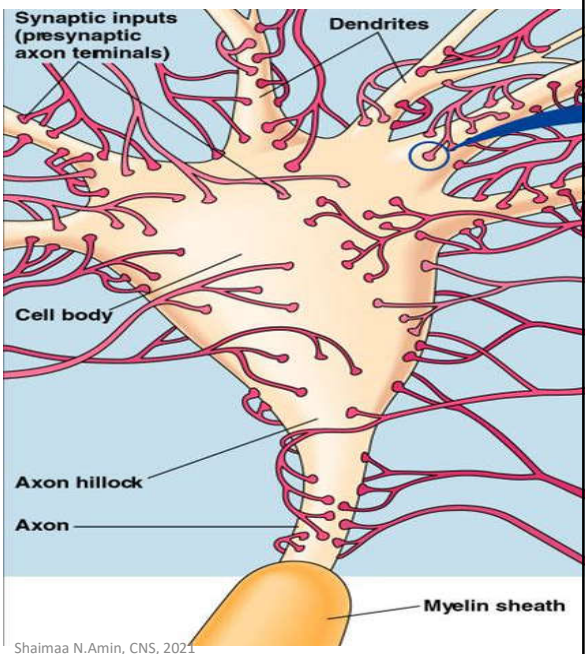
Grand postsynaptic potential

The sum of all EPSPs and IPSPs occurring approximately at the same time



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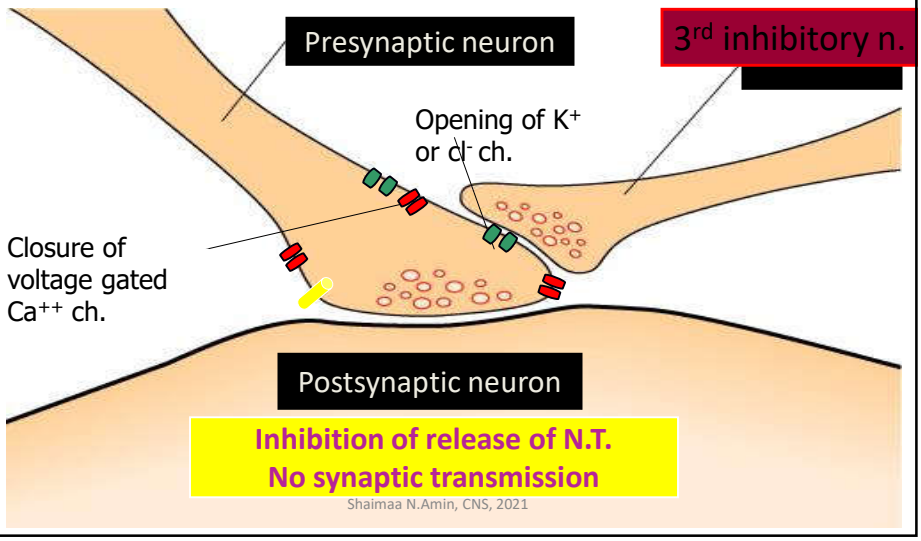
Presynaptic potentials

1. Presynaptic inhibition



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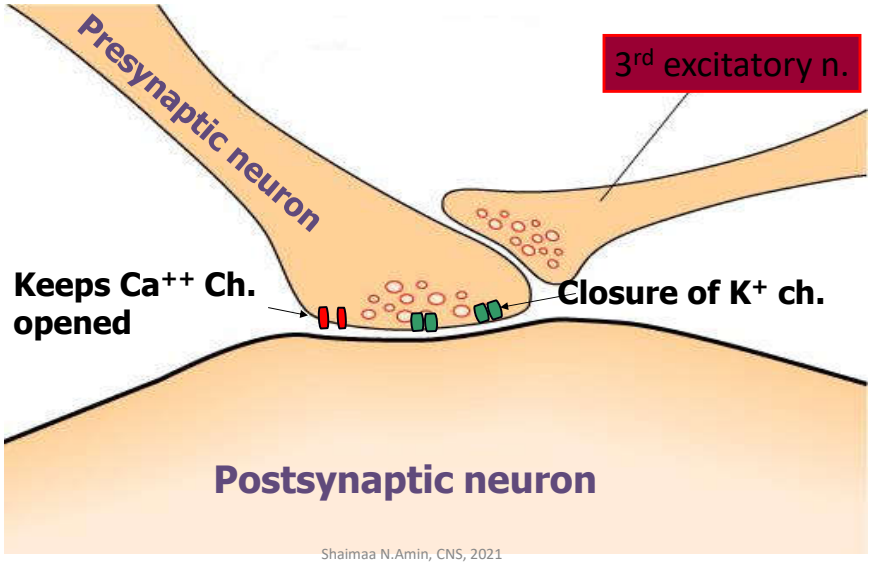
2. Presynaptic facilitation



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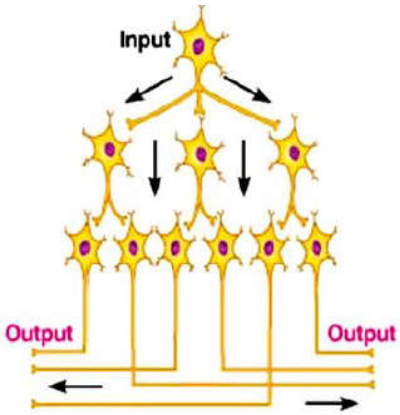
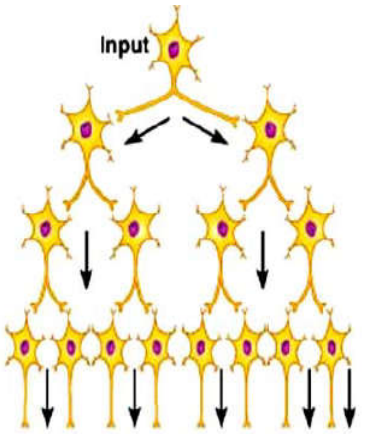
Organization of neurons in different neuronal pools

1. Divergence:



(b) Divergence to multiple pathways



(a) Divergence in same pathway

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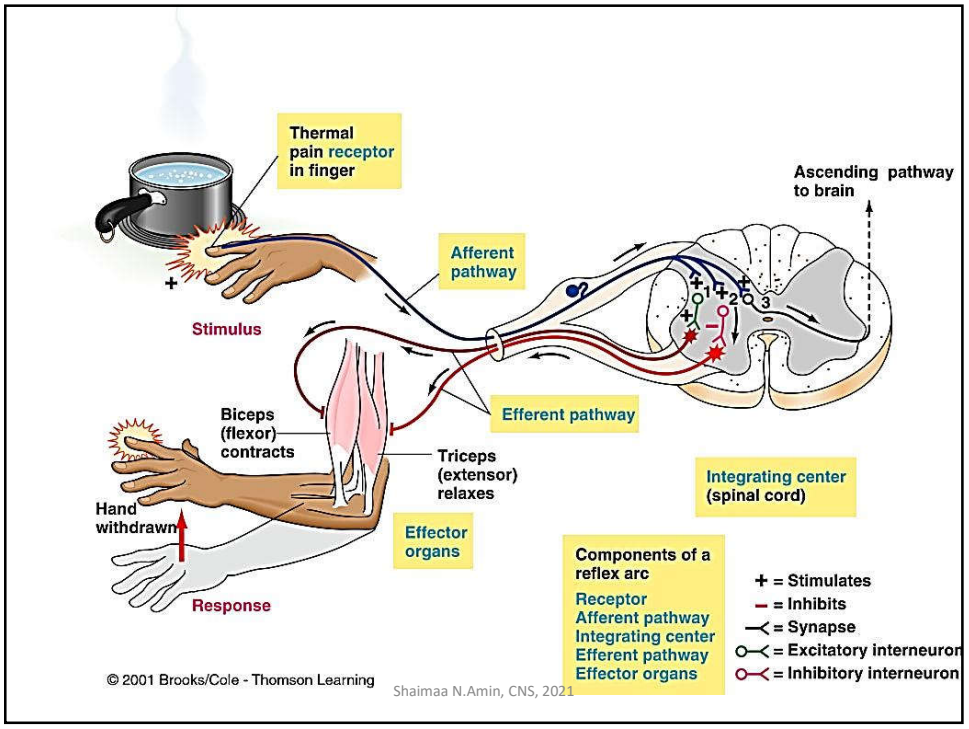

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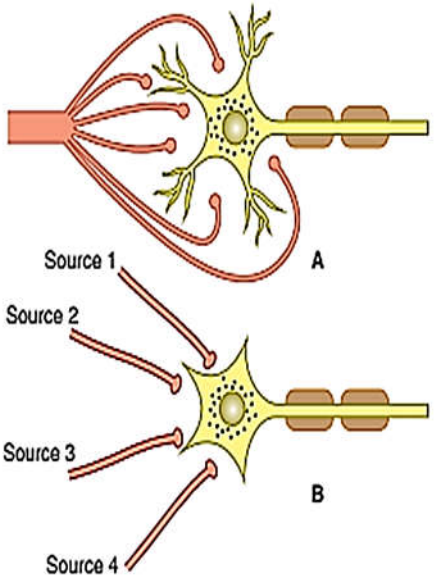
2. Convergence:



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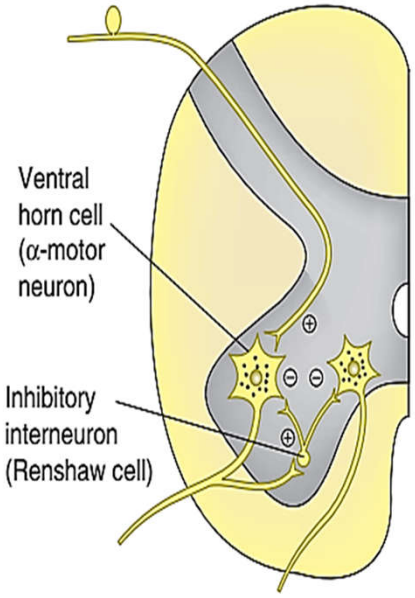
3. Inhibitory Circuits:



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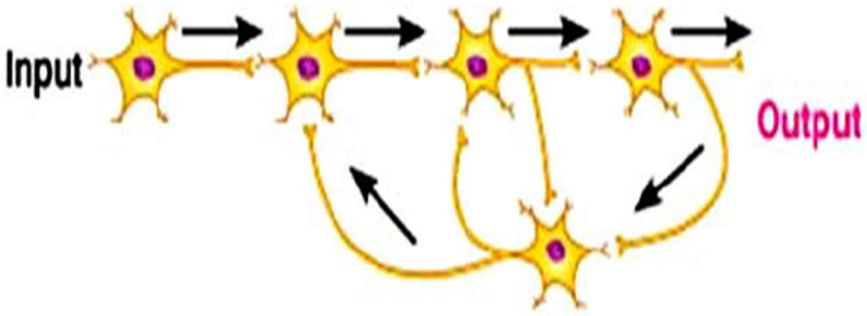
3. Reverberatory circuit :



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Inhibition At Synapses

- Post-synaptic inhibition
- Pre-synaptic inhibition
- Feedback inhibition and Lateral inhibition.
- Feed forward inhibition

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Characters of synaptic transmission

1. Forward direction

2. Synaptic delay

3. Fatigue

4. Summation property of synapse

6. Effect of acidosis and hypoxia

7.Synaptic Plasticity

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Factors affecting synaptic transmission

I. Changes in composition of internal environment:

A. PH of the blood

B. Hypoxia

C. Hypoglycemia

D. Hypocalcemia.

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