

Electrical and Synaptic transmission in nerve fibres -

In some cases it may be observed that the same transmitter (i.e. Acetylcholine) may be excitatory or inhibitory in both cases the effect depends on the receptor protein with which the transmitter interacts. All the excitatory and inhibitory inputs acting on a neuron are added algebraically and the neuron will fire new impulses in relation to these inputs as well as to its own spontaneous rhythm.

The presence of synaptic vesicles is the main characteristic of synapses. These are spherical and have a diameter of 40 to 50 nm and a membrane 4 to 5 nm thick. In the myoneural junction there are some 1000 vesicles per μm^2 , about 20% of them are attached to the presynaptic membrane and are ready to discharge the transmitter.

Special lectin proteins are present at the neuronal membrane corresponding to glycoprotein. The post synaptic density may play a role in mobility and development of synapse. It has been observed that the post synaptic densities are made up of coated vesicles coming from Golgi, prior to the appearance of synaptic vesicles at the terminal.

Types of Synapses -

- (1) Axodendritic → Axon to dendrite
- (2) Axosomatic - Axon to cell body
- (3) Axoaxonic - Axon to axon
- (4) Dendrodendritic - Dendrite to dendrite.

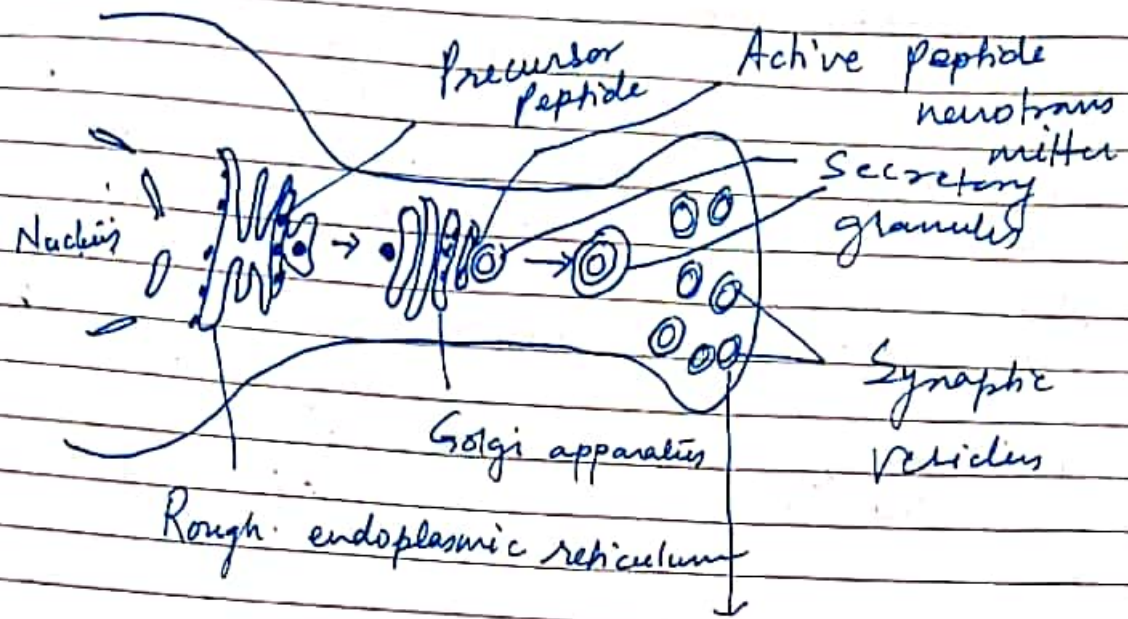
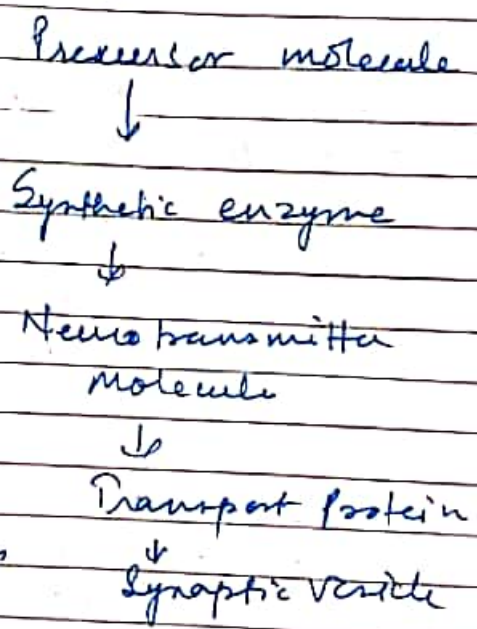


fig Neurotransmitter synthesis and storage.



Basic Principles-

- 1) Neurotransmitter Synthesis
- 2) Formation of Synaptic vesicle
- 3) fusion to synaptic cleft
- 4) Binding with post synaptic receptors
- 5) Biochemical or electrical response at the post synaptic cell
- 6) Removal of neurotransmitter from synaptic cleft.

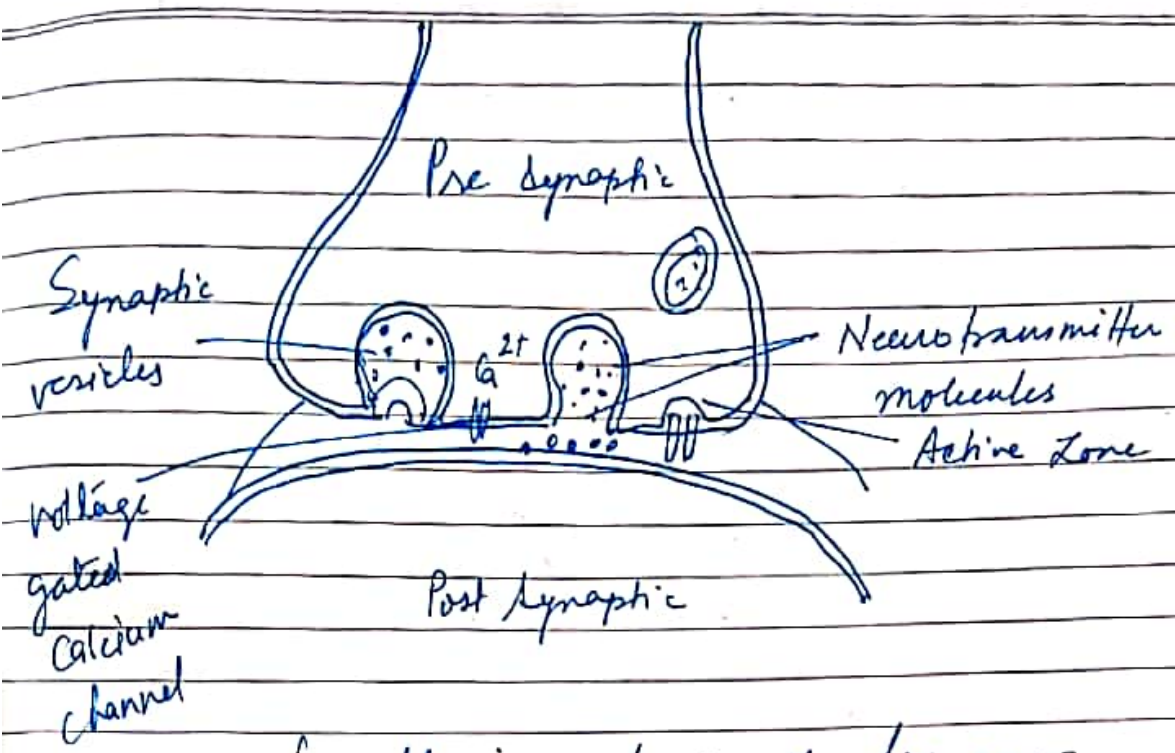
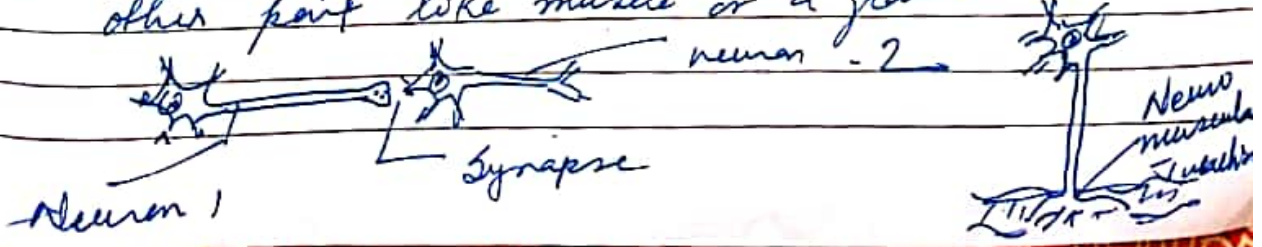


Fig - showing release of Na^+ neurotransmitters by the process of exocytosis.

- 1) Exocytosis stimulated by release of intracellular calcium
- 2) Proteins alter conformation
- 3) vesicle membrane incorporated into pre-synaptic membrane
- 4) Neurotransmitter released
- 5) vesicle membrane recovered by endocytosis

Key Points of Synaptic transmission →

① Synapse is the part of neuron which which joins with another neuron or any other part like muscle or a gland.



② Nerve impulses travels through the nerve cell due to change in the electrical charge across the cell membrane of axon due to movement of Na^+ and K^+ ions.

③ As the nerve impulse passes through the synapse it is passed to the next part either by electrical or chemical transmission.

④ At the end of neuronal synaptic vesicles are formed which mainly contains neurotransmitters for example acetylcholine, adrenaline, dopamine etc.

⑤ These vesicles fuse with the neurilemma and released outside to the post synaptic part and binds with receptors and brings out the required changes or the nerve impulse passes.

Practice questions

Q. No 1 what are synaptic vesicles? Name the chemical they contain? write the functions of these contents?

Q. No-2 what is a synapse? How is the nerve impulse transmitted across a synapse

By Dr. Kishu Verma.
Pg. Dept of Zoology,
Maharaja College Am.