SYNAPSE

Definition: Synapse is a gap between presynaptic and postsynaptic neuron

Presynaptic Neuron: Neuron that exists before the synapse.

Postsynaptic Neuron: Neuron that exists after the synapse.

Synaptic Cleft: Space between presynaptic and postsynaptic neuron.

Structural (shape) types of synapses:

- Neuro-neural (neuro-neuronic) synapse:
  Synapse between 2 neurons.

- Neuro-muscular synapse:
  Synapse between a neuron and a muscular cell.

- Neuro-glandular synapse:
  Synapse between a neuron and a glandular cell.

Neurotransmitters:

Are chemical substances stored in synaptic vesicles of the synaptic knobs or buds. They are released from the vesicle into the cleft by a process called "***Exocytosis***". Neurotransmitters bind to receptor sites

on the postsynaptic membrane and cause the opening of ionic channels.

Steps of Synaptic Transmission:

1. Arrival of Action Potential to presynaptic neuron
2. Opening of Ca^{2+} channels, leading to the flow of Ca^{2+} ions into presynaptic cytoplasm
3. Fusing of presynaptic vesicle with the presynaptic membrane, causes the exocytosis of neurotransmitters
4. Neurotransmitters bind to their specific receptors on postsynaptic membrane
5. Arrival of Action Potential to the postsynaptic neuron or muscle or gland.
6. Binding of the neurotransmitters on their specific enzymes causing their degradation

OR

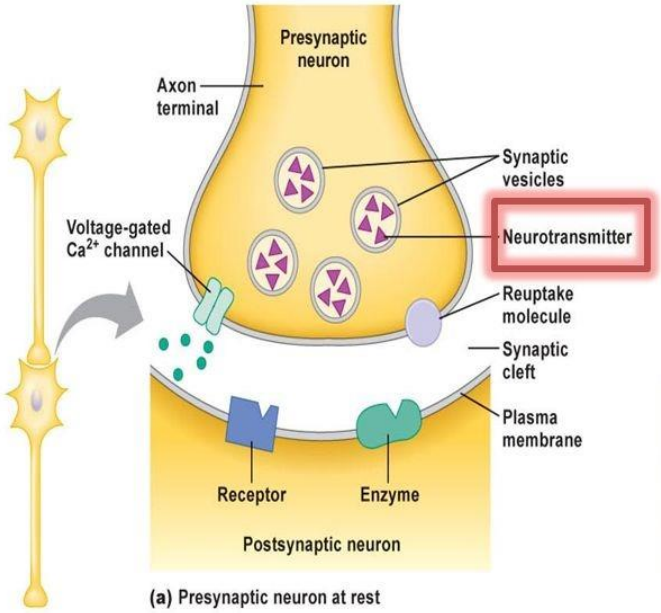
7. Reuptake of neurotransmitters by reuptake pump back to presynaptic neuron

OR

8. Diffusion of neurotransmitter outside the synapse

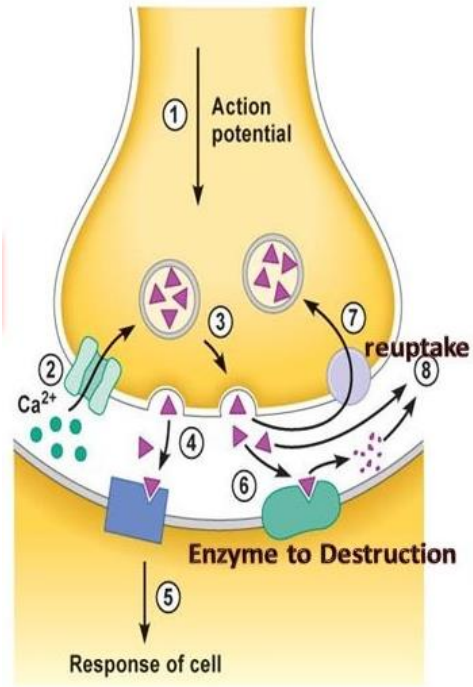
REMARK:

6,7 and 8 are the fate of the neurotransmitters! So it's either 6 or 7 or 8 according to what given.



(a) Presynaptic neuron at rest

Title: A diagram showing presynaptic neuron at rest



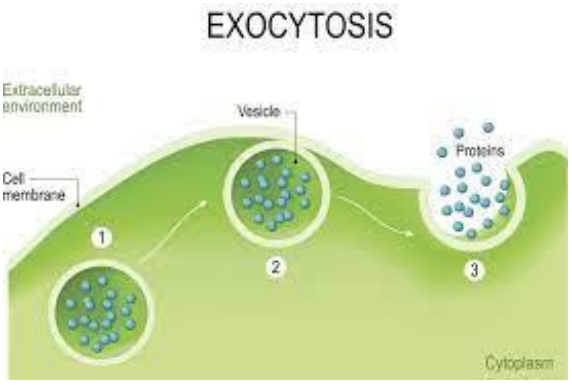
(b) Active presynaptic neuron

Title: A diagram showing presynaptic neuron that is active

Function Types of Synapses:

- Inhibitory Synapse:
  - Entrance of Cl^-
  - Decrease in the membrane polarity
  - Hyperpolarized
  - Exit of K^+
  - Sleep/relaxation/resting…
- Excitatory Synapse:
  - Na channels open
  - Increase of Na^+ permeability
  - Increase in the diffusion of Na^+ to the outside
  - Increase in in polarity
  - Depolarization/ Hypolarization
  - Secretion of hormones/ blood pressure…

REMARK:



NOTE:

-Neurotransmitters are protein

Acetylcholine → Excitatory

Dopamine → Excitatory

Glumate → Excitatory

P substance → Excitatory

Serotonin → Excitatory and Inhibitory

GABA → Inhibitory

Enkephaline → Inhibitory

Adrenaline → Excitatory

Endorphine → Excitatory

REMARKS:

-In Excitatory:

- Na^+ open and diffuses to the inside
- More +ve: Depolarization
- There is Action Potential
- Frequency of Action Potential increases

-In Inhibitory:

- K^+ opens: Diffuses to the inside; enter of Cl
- More –ve: Hyperpolarization
- No Action Potential
- Frequency of Action Potential reduces OR inhibits

Mode of Action of Excitatory ***OR*** Inhibitory:

Interprets:

- This means that, the nervous message propagates from presynaptic neuron to postsynaptic neuron (or muscle)

- The nervous message along the synapse in unidirectional

- Ca^{2+} is essential for the propagation of nervous message from pre to post (Role of Ca^{2+})