

# 03 - B. Synaptic activity

## B. Synaptic activity

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1. Physiology of Neuronal Activity A. Action Potentials An action potential is initiated at the axonal hillock when the synaptic signals received by the dendrites and soma are sufficient to raise the intracellular resting membrane potential from -70 mV to the threshold potential of -55mV. At -55mV, the Na<sup>+</sup> channels present at the axon's initial segment will open. The subsequent Na<sup>+</sup> influx causes rapid reversal of the membrane potential from the negative values to +40 mV. When the membrane potential reaches +40mV, the Na<sup>+</sup> channels close and the voltage-gated K<sup>+</sup> channels open. As K<sup>+</sup> ions move out of the axon, the cell membrane gets "repolarized". B. Synaptic activity A synapse is a junction between 2 nerve cells. Three types of synapses are noted in the nervous system. □ Chemical synapses: Presynaptic neuron releases a chemical molecule on stimulation. This molecule acts on the next neuron to bring on a molecular effect or to propagate the impulse further downstream. o Depending on the effects noted on the postsynaptic neuron, a chemical synapse could be classified as either excitatory or inhibitory. Postsynaptic neurons are depolarized by activity at the excitatory synapses; inhibitory synaptic activity serves to hyperpolarize them. o In some instance the postsynaptic changes induced by an excitatory synapse may be sufficient to induce an action potential, but may serve to facilitate the likelihood of generating an action potential with further stimulation. This process is called facilitation. Due to this, additional input from several other presynaptic cells through other synapses may result in a spatial summation effect leading to an action potential. Similarly recurrent stimulation by the same synapse can result in temporal summation that leads to an action potential. □ Electrical synapses: They bring on the response by electrical communication without chemical exchange. □ Conjoint synapses: These have both electrical and chemical properties.

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