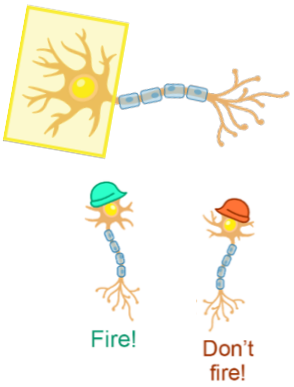
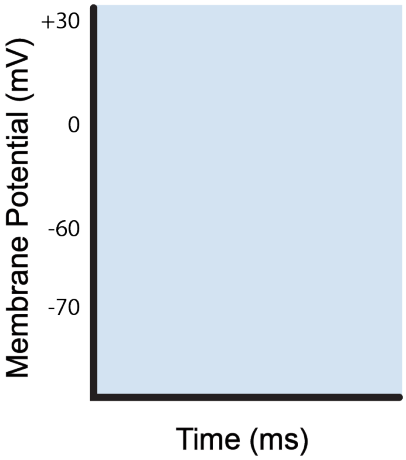
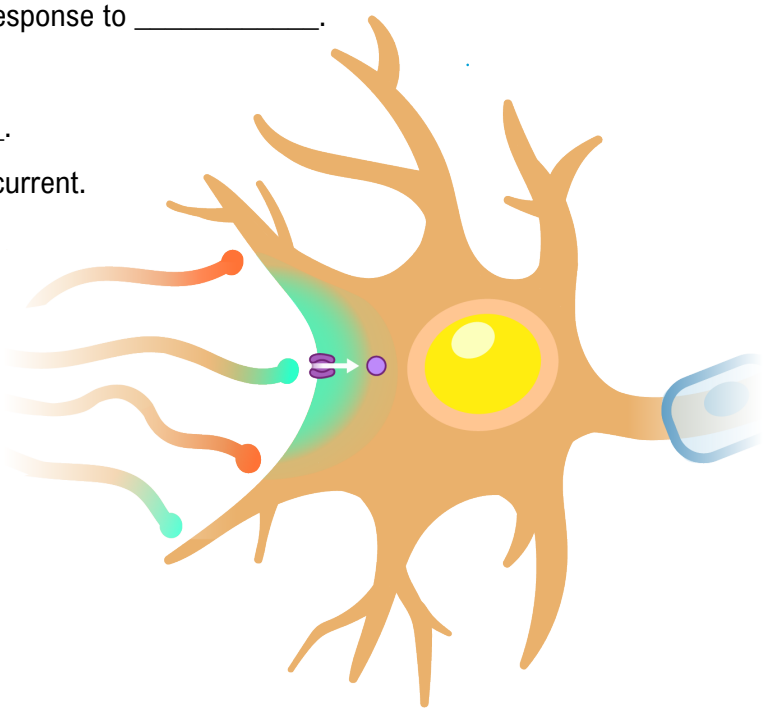
TOPIC: GRADED POTENTIALS



- **Postsynaptic Potential:**
  - Change in membrane potential at postsynaptic terminal of chemical synapse.
  - Postsynaptic potentials are _____ potentials. Two types:
    - Excitatory Postsynaptic Potentials (EPSPs): Make membrane more _____.
    - Inhibitory Postsynaptic Potentials (IPSPs): Make membrane more _____.
- **Sequence of a Depolarizing Graded Potential:**
  - **Step 1:** Gated Na+ channels open in response to _____.
  - **Step 2**: Na+ ions enter the cell.
  - **Step 3**: Inside of cell _____.
  - **Step 4**: Depolarization spreads in local current.
  - **Step 5**: Current dissipates.





EXAMPLE: When voltage gated sodium channels open in response to a stimulus, what effect does it have on the neuron?

a) Potassium will rush out of the cell.

b) Sodium enters the cell.

c) The influx of positive ions causes the cell to depolarize.

d) Both b and c.

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PRACTICE: A graded potential is strongest at the _____:

a) Initial zone of the axon.

b) Location on the membrane with the most voltage-gated potassium channels.

c) Site of stimulation.

d) Axolemma.

PRACTICE: An excitatory postsynaptic potential (EPSP) is _____.

a) the same as a nerve impulse along an axon.

b) a result of a stimulus strong enough to produce threshold.

c) a graded depolarization produced by the arrival of a neurotransmitter.

d) an action potential complying with the all-or-none principle.

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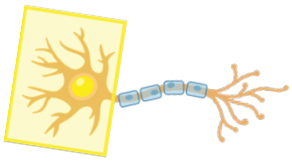
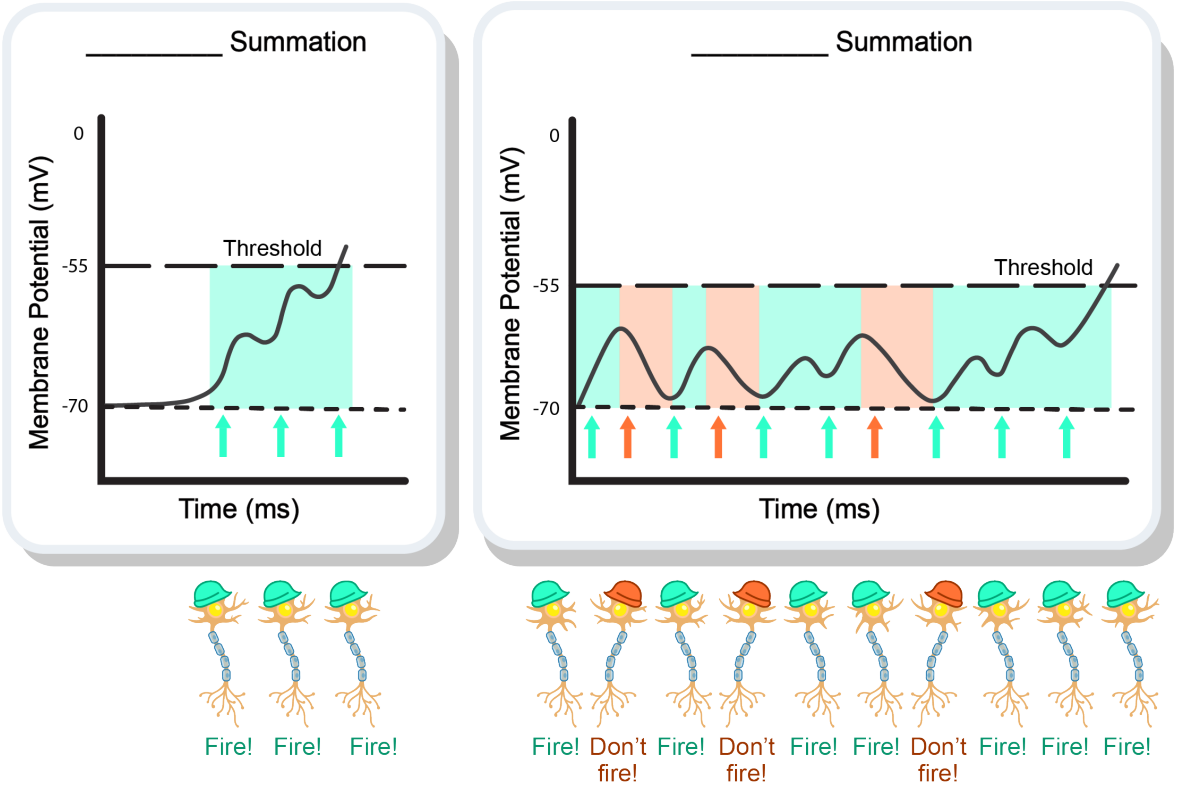


Summation

- **Summation:** Adding _____ postsynaptic potentials at initial segment. Two types:
  - **Temporal Summation**: Summation of graded potentials at one synapse overlapping in _____.
  - **Spatial Summation**: Summation of multiple graded potentials in close _____.



EXAMPLE: Imagine fifteen neurons synapse on one postsynaptic neuron. At the trigger zone, 13 of the neurons produce EPSPs of 2 mV each, and the other 2 produce IPSPs of 3 mV each. The threshold for the postsynaptic cell is -55 mV. In this scenario, would an action potential be produced? The postsynaptic neuron has a resting membrane potential of -70 mV.

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PRACTICE: When a second EPSP arrives at a single synapse before the effects of the first have disappeared, what results?

a) Temporal summation.

b) Spatial summation.

c) Hyperpolarization.

d) Inhibition of the impulse.

PRACTICE: The EPSPs from two different synapses occur at the same time and cause a larger depolarization than either one alone can cause. This is an example of:

a) Presynaptic inhibition.

b) Postsynaptic melding.

c) Temporal summation.

d) Spatial summation.