

Ion Channels (Part 2)

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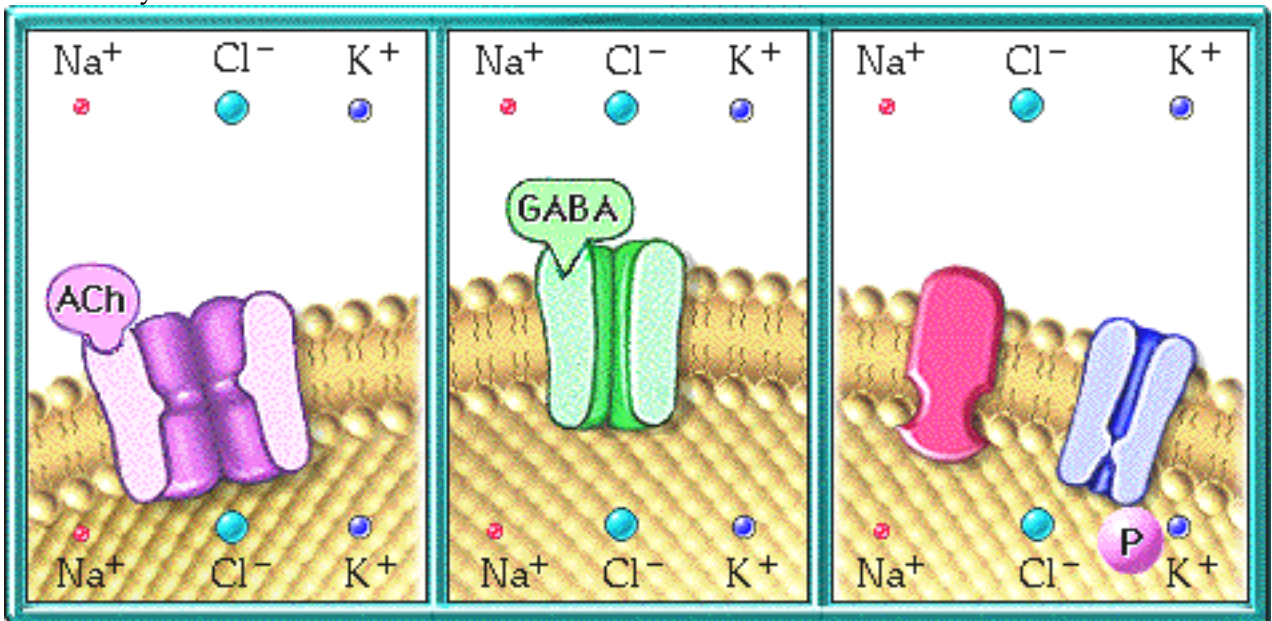
Quiz Question #2: Ion Channels

- This question asks you to determine the differences between voltage gated channels and chemically-gated channels.



Quiz Question #3: Ion Channels Review

- This question asks you to drag the correct ion to the channel.
- Record your answers here:



Quiz Question #4: Neurotransmitters

- This question asks you to drag the neurotransmitters to the correct panel.
- Record your answers here:

Epinephrine Glutamate Glycine		
GABA NE Serotonin		
Peptides ACh Dopamine		
Direct (only)	Both Direct and Indirect	Indirect (only)

Quiz Question #5: Ion Channels for Rapid IPSPs

- This question asks you to link the correct responses for a G-protein type activation.

of ions makes the inside of the cell more positive.

a. excitatory postsynaptic potential, EPSP

b. inhibitory postsynaptic potential, IPSP

13. (Page 5.) Ion channels at a typical excitatory synapse are specific for cations, having a watery pore large enough to pass both sodium and potassium. In a resting neuron, the electrochemical gradient for sodium is very large and causes sodium to move _____ _____. The electrochemical gradient for potassium causes it to move _____ _____, but the gradient is very small.

a. into the cell, out of the cell

b. out of the cell, into the cell

14. (Page 5.) Notice that more sodium moves _____ than potassium moves out.
a. into the cell b. out of the cell
15. (Page 5.) Excitatory postsynaptic potentials _____ neurons.
a. hyperpolarize b. depolarize
16. (Page 5.) If the neuron is depolarized to _____, an action potential is generated.
a. threshold b. 0 millivolts c. +30 millivolts
17. (Page 6.) An _____, or _____, is produced when the movement of ions makes the inside of the cell more negative.
a. inhibitory postsynaptic potential, IPSP b. excitatory postsynaptic potential, EPSP
18. (Page 6.) Ion channels at a typical inhibitory synapse are specific for chloride and the electrochemical gradient for chloride causes it to move into the cell. Inhibitory postsynaptic potentials _____ neurons making the membrane potential more _____.
a. hyperpolarize, negative b. depolarize, positive
19. (Page 7.) Some neurotransmitters bind to receptors that are separate from ion channels. This process most often leads to production of _____, which ultimately alter ion channels. Such neurotransmitters are said to act indirectly.
a. chemically labile neurotransmitters b. intracellular second messengers
20. (Page 7.) The receptor is coupled to the ion channel by a _____.
a. G protein b. neurotransmitter c. electrical synapse
21. (Page 7.) At rest, guanosine diphosphate, or _____, is bound to the G protein.
a. GDP b. GTP
22. (Page 7.) When norepinephrine binds to the receptor, the _____ is activated, releases GDP, and binds guanosine triphosphate, or GTP, which is a high-energy molecule.
a. G protein b. neurotransmitter c. electrical synapse
23. (Page 7.) Part of the activated G protein travels in the membrane and activates an _____, which induces production of a second messenger.
a. protein b. enzyme c. neurotransmitter
24. (Page 7.) The _____ is the first messenger.
a. protein b. enzyme c. neurotransmitter
25. (Page 7.) The second messenger activates an intracellular enzyme, which _____ a potassium ion channel and closes it.
a. deactivates b. activates
26. (Page 7.) In the resting neuron, movement of _____ out of the cell acts to hyperpolarize the cell.
a. sodium b. chloride c. potassium
27. (Page 7.) Closing these channels results in the membrane potential becoming _____ and _____ the cell.
a. less negative and depolarizing b. more negative and hyperpolarizing

28. (Page 7.) _____ of the cell by the indirect method is time consuming. The resulting _____ is slow in onset, and long in duration.

a. Depolarization, depolarization

b. Hyperpolarization, hyperpolarization

29. (Page 7.) Besides excitation, indirectly-acting neurotransmitters can also produce slow inhibition. The neurotransmitters _____, _____, _____, and _____ can act indirectly as well as directly, depending on the receptor to which they bind.

- a. acetyl choline, norepinephrine, epinephrine, and dopamine
- b. acetylcholine, glutamate, GABA, and serotonin

30. (Page 7.) The catecholamines (_____, _____, and _____) and peptide neurotransmitters only act indirectly.

- a. norepinephrine, epinephrine, and dopamine
- b. glutamate, GABA, and serotonin

31. Choose the correct order of these reactions:

