

STEIN GRADED QUIZ 1 -- BIOLOGY 3058 -- MARCH 30, 2020 -- PAGE 1 of 4

There are 6 physiology questions in this Biology 3058 GRADED QUIZ.

All these questions are "A, B, C, D, E, F, G, H" questions worth one point each.

There is a total of 6 points in this exam.

The format for this exam is:

Select A if A is the only correct answer.

Select B if B is the only correct answer.

Select C if C is the only correct answer.

Select D if both A and B are correct (and C is NOT correct).

Select E if both A and C are correct (and B is NOT correct).

Select F if both B and C are correct (and A is NOT correct).

Select G if A and B and C are all correct.

Select H if none of the above is correct (A is NOT correct, B is NOT correct, and C is NOT correct).

ONLY SELECT ONE LETTER PER PHYSIOLOGY QUESTION.

There are two honor questions. In order to receive credit for this GRADED QUIZ, you must truthfully answer TRUE for both questions. If you answer FALSE for either question or if you do not answer either question, your GRADED QUIZ grade is 0 (zero).

- Q1:1. Neuron A is a healthy neuron with all the usual ion channels. When at rest with a membrane voltage of R millivolts, neuron A produces no action potentials. The voltage threshold for an action potential in neuron A is T millivolts. T is greater than R; T is less than zero. In addition, neuron A's membrane includes the membrane-spanning molecule Z with an ion channel that opens when neurotransmitter Y binds to the Y receptor site on the extracellular surface of Z. The Nernst equilibrium potential for Z's ion channel is E millivolts. Neuron B synapses on neuron A; neuron B's neurotransmitter is neurotransmitter Y. Neuron A is initially at rest. Which of the following statements are true when neuron B produces an action potential and releases neurotransmitter Y?
- A. If the value of E is greater than R, and if the value of T is greater than E, and if chloride is the only ion that passes through open Z channels, then Y's binding to its receptor site on Z in neuron A produces an inhibitory postsynaptic potential in neuron A, an increase in chloride conductance of the plasma membrane of neuron A, and a decrease in the amount of intracellular chloride ions in neuron A.
 - B. If the value of R is equal to E, and if chloride is the only ion that passes through open Z channels, then Y's binding to its receptor site on Z in neuron A produces an inhibitory postsynaptic potential in neuron A, an increase in chloride conductance of the plasma membrane of neuron A, and an increase in the amount of intracellular chloride ions in neuron A.
 - C. If the value of E is zero and if both sodium ions and potassium ions pass through open Z channels, then Y's binding to its receptor site on Z in neuron A produces an excitatory postsynaptic potential in neuron A, an increase in the amount of intracellular sodium ions in neuron A, and an increase in the amount of intracellular potassium ions in neuron A.
 - D. A and B.
 - E. A and C.
 - F. B and C.
 - G. A, B, and C.
 - H. None of the above.

- Q1:2. Which of the following is a ligand that binds to a receptor site that is part of a ligand-gated metabotropic receptor?
- A. Strychnine.
 - B. TTX (tetrodotoxin).
 - C. Muscarine.
 - D. A and B.
 - E. A and C.
 - F. B and C.
 - G. A, B, and C.
 - H. None of the above.
- Q1:3. Consider a system that contains three neurons in a culture dish bathed in normal physiological saline. All three neurons are healthy. Neuron A synapses onto Neuron B. Neuron B synapses onto Neuron C. Neuron A has glycine in its synaptic vesicles. Neuron B has GABA in its synaptic vesicles. The only ligand-gated receptors in the plasma membrane of Neuron A are AMPA Receptors. The only ligand-gated receptors in the plasma membrane of Neuron B are Glycine Receptors. The only ligand-gated receptors in the plasma membrane of Neuron C are GABA_A Receptors. All 3 neurons have no other ligand-gated receptors in their plasma membranes. All 3 neurons have a sodium equilibrium potential of +60 millivolts. All 3 neurons have a potassium equilibrium potential of -86 millivolts. All 3 neurons a chloride equilibrium potential of -70 millivolts. The threshold for an action potential in all 3 neurons is -55 millivolts. At 1:55 AM, glutamate is added to the physiological saline. At 2:00 AM, the action potential firing rate of each neuron is 100 Hz. Which of the following will lead to a decrease in Neuron C's action potential firing rate?
- A. At 2:01 AM, GABA is added to the bath.
 - B. At 2:01 AM, strychnine is added to the bath.
 - C. At 2:01 AM, CNQX is added to the bath.
 - D. A and B.
 - E. A and C.
 - F. B and C.
 - G. A, B, and C.
 - H. None of the above.
- Q1:4. Which of the following occur after an increase in the length of the right knee extensor muscle that happens after a quick tap is applied to the right patellar tendon?
- A. An increase in the amount of AMPA released from the central axon terminals of IA muscle-spindle stretch receptor neurons whose peripheral axon terminals are located in the right knee extensor muscle.
 - B. An increase in the total amount of intracellular potassium in the peripheral axon terminals of IA muscle-spindle stretch receptor neurons whose peripheral axon terminals are located in the right knee extensor muscle.
 - C. An increase in the total amount of calcium within the sarcoplasmic reticulum of the right knee extensor muscle.
 - D. A and B.
 - E. A and C.
 - F. B and C.
 - G. A, B, and C.
 - H. None of the above.

Q1:5. Which of the following are neurotransmitters?

- A. AMPA.
- B. NMDA.
- C. GABA.
- D. A and B.
- E. A and C.
- F. B and C.
- G. A, B, and C.
- H. None of the above.

Q1:6. A complete motor neuron is removed from a frog and placed in a large volume of modified extracellular saline. The neuron is healthy; it has a stable resting voltage of -70 millivolts. It is not producing any action potentials; its threshold for an action potential is -50 millivolts. The only ligand-gated Receptors in the neuron's plasma membrane are AMPA Receptors, GABA_B Receptors, and Glycine Receptors. The equilibrium potential for chloride ions is -70 millivolts, the equilibrium potential for potassium ions is -90 millivolts, and the equilibrium potential for sodium ions is +60 millivolts.

- A. The addition of glycine and GABA to the physiological saline will lead to an increase in the amount of intracellular chloride and a decrease in the amount of intracellular potassium.
- B. The addition of glycine to the physiological saline will lead to no change in the chloride conductance of the plasma membrane of the neuron.
- C. The addition of glycine and glutamate to the physiological saline will lead to a decrease in the amount of intracellular chloride, an increase in the amount of intracellular sodium, and a decrease in the amount of intracellular potassium.
- D. A and B.
- E. A and C.
- F. B and C.
- G. A, B, and C.
- H. None of the above.

ANSWER KEY CORRECT ANSWERS:

Q1:1: A

Q1:2: C

Q1:3: G

Q1:4: H

Q1:5: C

Q1:6: H