

STEIN GRADED QUIZ3 -- BIOLOGY 3058 -- APRIL 6, 2020 -- PAGE 1 of 4

There are 6 physiology questions (Q2-Q7) 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, Q1 and Q7. 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).

- Q3:1. Consider five culture dishes; each dish has one healthy neuron in it. Dish V has Neuron V in it; Dish W has Neuron W in it; Dish X has Neuron X in it; Dish Y has Neuron Y in it; and Dish Z has Neuron Z in it. At 1:00 AM: each neuron is bathed in normal physiological saline; all the neurons have the same properties; and each neuron is at rest with a resting potential of -70 millivolts. Each neuron has only three types of ionotropic ligand-gated receptors: AMPA Receptors, NMDA Receptors, and Glycine Receptors. None of the neurons have metabotropic receptors. Each neuron has a chloride equilibrium potential of -80 millivolts. At 1:55 AM, a large amount of TTX is added to the physiological saline in all five dishes. Ignore any effects due to voltage-gated calcium channels with S4 helices. The AMPA Receptor channels in these neurons do not have calcium conductance when these AMPA Receptor channels are open. At 1:58 AM, the amount of intracellular calcium in each neuron is the same as that of each other neuron. At 2:00 AM:
- glutamate is added to the physiological saline of Dish V;
 - glutamate and APV are added to the physiological saline of Dish W;
 - glutamate and CNQX are added to the physiological saline of Dish X;
 - glutamate and glycine are added to the physiological saline of Dish Y;
 - glutamate, glycine, and strychnine are added to the physiological saline of Dish Z.
- A. At 2:01 AM, the total calcium conductance in Neuron V is less than the total calcium conductance in Neuron W. In addition, the total calcium conductance in Neuron Z is less than the total calcium conductance in Neuron Y.
 - B. At 2:01 AM, the total sodium conductance in Neuron W is greater than the total sodium conductance in Neuron X. In addition, the total sodium conductance in Neuron Z is greater than the total sodium conductance in Neuron Y.
 - C. For each neuron, MAXV is the maximum voltage that is reached by that neuron during the period from 2:00 AM to 2:02 AM. The MAXV in Neuron W is less than the MAXV in Neuron X. In addition, the MAXV in Neuron Z is less than the MAXV in Neuron Y.
 - D. A and B.
 - E. A and C.
 - F. B and C.
 - G. A, B, and C.
 - H. None of the above.

- Q3.2. A healthy skeletal muscle fiber is isolated and has no external forces on it. It has normal intracellular levels of ATP and is bathed in physiological saline. Which of the following occur in response to an action potential in the plasma membrane of the muscle fiber?
- A. A conformational change in Dihydropyridine (DHP) Receptors in the membranes of the transverse tubules.
 - B. An increase in the calcium conductance of the channel associated with the Ryanodine Receptor in the membranes of the sarcoplasmic reticulum.
 - C. An increase in the amount of calcium ions bound to tropomyosin.
 - D. A and B.
 - E. A and C.
 - F. B and C.
 - G. A, B, and C.
 - H. None of the above.
- Q3.3. In the sarcomere of a skeletal muscle, there are
- A. myosin molecules in the I band.
 - B. troponin molecules in the region of the A band that is not in the H zone.
 - C. actin molecules in the H zone.
 - D. A and B.
 - E. A and C.
 - F. B and C.
 - G. A, B, and C.
 - H. None of the above.
- Q3.4. An increase in the calcium conductance of all the sarcoplasmic reticulum membranes of a skeletal muscle with no external forces on it leads to
- A. an increase in the amount of calcium ions in the sarcoplasmic reticulum.
 - B. an increase in the amount of ATP molecules in the muscle.
 - C. an increase in the amount of calcium ions that are bound to troponin.
 - D. A and B.
 - E. A and C.
 - F. B and C.
 - G. A, B, and C.
 - H. None of the above.

- Q3.5. Which of the following serves as an effector, or as part of an effector, in a negative feedback system?
- A. Action potentials in carotid artery baroreceptor neurons.
 - B. Action potentials in cells in the Bundle of His.
 - C. Action potentials in parasympathetic neurons that release acetylcholine (ACh) near the SA node of the heart.
 - D. A and B.
 - E. A and C.
 - F. B and C.
 - G. A, B, and C.
 - H. None of the above.
- Q3.6 Consider a single cycle in a healthy heart. Define the start of the cycle as the beginning of the action potential in a SA node cell, which occurs at t_1 , and the end of the cycle as the beginning of the following action potential in that same SA node cell, which occurs at t_2 . The beginning of the SA node cell action potential is the time when the voltage of the SA node cell crosses the threshold for an action potential, that is, the time when SA node cell voltage goes from below threshold to above threshold. During the interval between t_1 and t_2 , there are 2 heart sounds. The first heart sound is *lub*; the second heart sound is *dub*. Which of the following is true?
- A. In that single cycle during the time interval between the end of the *lub* sound and the start of the *dub* sound, the pressure in the left atrium is less than the pressure in the left ventricle and the left AV valve is in the closed position.
 - B. In that single cycle, the volume of blood in the left ventricle at the end of the *lub* sound is less than the volume of blood in the left ventricle at the start of the *dub* sound.
 - C. In that single cycle during the time interval between the end of the *dub* sound and t_2 , there is an increase in the volume of blood in the left ventricle.
 - D. A and B.
 - E. A and C.
 - F. B and C.
 - G. A, B, and C.
 - H. None of the above.

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ANSWER KEY:

Q3:1 B

Q3:2 D

Q3.3 B

Q3.4 C

Q3.5 B

Q3.6 E