

Name: _____KEY_____

Date: _____

Quiz 1

Please circle the best response for each multiple-choice question. To earn full credit, **please answer each short answer question using complete sentences.** You can write on the back of the page as needed.

- 1) Which of these statements about homeostasis is true? (2pts)
 - a. Effectors detect changes in the internal environment.
 - b. The internal environment is maintained absolutely constant.
 - c. Homeostasis is maintained by turning effectors on and off.
 - d. Negative feedback mechanisms act to correct deviations from a normal range within the internal environment.**
- 2) What type of intravenous fluid would be given to reduce edema (excessive retention of fluid)? (2 pts)
 - a. A hypertonic solution**
 - b. An isotonic solution
 - c. A hypotonic solution
 - d. More information is needed to answer this question.
- 3) What causes a membrane potential difference to exist for excitable cells like neurons and muscle cells? What active transport process helps maintain this potential difference (maintains the resting membrane potential)? (4 pts)

The membrane has different permeability to sodium and potassium ions, allowing more movement of potassium ions in and out of the cell. Potassium is drawn to the fixed anions located within the cell. (2 pts)
The Na⁺/K⁺ ATPase pump moves three Na⁺ out and two K⁺ in for every molecule of ATP hydrolyzed, which creates a concentration gradient and maintains a membrane potential difference for the cell. (2 pts)

- 4) Describe the events of an action potential in a step-by-step manner. Be sure to include what events return the cell to a resting membrane potential. (4 pts)
 - 1. A stimulus causes a depolarization that causes membrane potential to reach threshold. (1 pt)*
 - 2. Voltage-gated Na⁺ channels open, and Na⁺ enters the cell, causing the membrane potential to become less negative/more positive. (1 pt)*
 - 3. At approximately +30mV, voltage-gated K⁺ channels open, and K⁺ leaves the cell, causing the membrane potential to become more negative. Voltage-gated Na⁺ channels are inactivated. (1 pt)*
 - 4. Voltage-gated K⁺ channels close, and some K⁺ continues to leak from the cell causing a hyperpolarization. (0.5 pt)*
 - 5. The Na⁺/K⁺ ATPase pump re-establishes resting membrane potential. (0.5 pt)*

- 5) Describe the structure of nicotinic cholinergic receptors. Explain what neurotransmitter binds to these receptors and how the neurotransmitter interacts with these receptors to cause the production of an EPSP. (4 pts)

Nicotinic cholinergic receptors are ligand-gated ion channels for Na^+ (and some K^+) that open in response to the binding of acetylcholine (ACh). (2 pts)

The flow of Na^+ ions in (and some K^+ out) leads to a localized increase in membrane potential causing the EPSP. (2 pts)

- 6) Compare and contrast cholinergic signaling and adrenergic signaling from post-ganglionic neurons. Be sure to indicate the neurotransmitters involved and with which division of the autonomic nervous system each type occurs. (4 pts)

The parasympathetic division uses acetylcholine as the neurotransmitter from post-ganglionic neurons. Cholinergic signaling from post-ganglionic neurons releases acetylcholine which binds with muscarinic cholinergic receptors on effector organs. (2 pts)

The sympathetic division uses norepinephrine as the neurotransmitter (and epinephrine) from post-ganglionic neurons. Adrenergic signaling from post-ganglionic neurons releases norepinephrine which binds to adrenergic receptors of either alpha- or beta- varieties on effector organs. (2 pts)