

Exam 1 for PGY451/551, September 2010

Choose the **ONE BEST** answer:

(1) The Nernst equilibrium potential for K^+ is determined by:

- (A) extracellular concentration of K^+
- (B) intracellular concentration of K^+
- (C) temperature of the cell
- (D) A and B
- (E) A, B and C

Answer: (E)

(2) What is the best answer regarding the concentrations of following ions inside and outside the cells:

- (A) $[K^+]$: inside $>$ outside
- (B) $[Na^+]$: inside $<$ outside
- (C) $[Ca^{2+}]$: inside $<$ outside
- (D) A and C
- (E) A, B and C

Answer (E)

(3) Na^+, K^+ -dependent ATPase

- (A) largely determines the intracellular concentration of Na^+
- (B) largely determines the intracellular concentration of K^+
- (C) utilizes ATP hydrolysis to transport ions against their gradients
- (D) A and B
- (E) A, B and C

Answer (E)

(4) At resting membrane potential,

- (A) K^+ flows from inside to outside of the cell
- (B) K^+ flows from outside to inside of the cell
- (C) Ions do not move across the plasma membrane
- (D) Na^+ and K^+ flow in the same direction
- (E) Ions have reached their equilibrium potentials.

Answer: (A)

(5) Action potentials

- (A) are fired in an all-or-none fashion, depending on whether a threshold is passed
- (B) can be fired in all kinds of cells as long as they express K^+ channels
- (C) are initiated randomly on any part of plasma membrane of a neuron
- (D) are fired due to the inherent instability of the resting membrane potential
- (E) rely on voltage-gated Ca^{2+} channels.

Answer (A)

(6) Action potentials:

- (A) encode information in their amplitudes
- (B) in the same train have the same amplitude
- (C) encode information in their frequency
- (D) B and C
- (E) A and B

Answer (D)

(7) Which is the best answer about the conduction velocity of action potentials?

- (A) it inversely correlates with the diameter of axon
- (B) myelination increases it
- (C) it is reduced in multiple sclerosis
- (D) A and B
- (E) B and C.

Answer (E)

(8) Which is the best answer about the nodes of Ranvier?

- (A) They have enriched expression of Na⁺ channels
- (B) They relay action potentials in a salutatory manner
- (C) The nodes are heavily myelinated.
- (D) A and B
- (E) A, B and C.

Answer (D)

(9) A neuron is firing action potentials at 200 Hz, this means that:

- (A) the relative refractory period is more than 10 msec.
- (B) the total refractory period is less than 5 msec.
- (C) the absolute refractory period is 10 msec
- (D) refractory period cannot be estimated
- (E) the total refractory period is more than 10 msec.

Answer (B)

(10) How does novocaine work?

- (A) it blocks K⁺ channels to prevent the firing of action potentials.
- (B) it blocks Na⁺ channels
- (C) it blocks action potential so your brain does not perceive pain
- (D) B and C
- (E) A, B and C

Answer (D)

(11) At neuromuscular junction, acetylcholine

- (A) is synthesized in the cytosol in the skeletal muscle cell
- (B) is sequestered in synaptic vesicles at very high concentration
- (C) is quickly broken down in the skeletal muscle cells once it is taken up the cell
- (D) blocks the end plate potential at neuromuscular junction

(E) passes through acetylcholine receptor channel to produce the end plate potential

Answer (B)

(12) Which is the best answer about the end plate potential?

- (A) It is generated in an all-or-none fashion
- (B) It propagates in the skeletal muscle cells with decrement
- (C) It always triggers an action potential in the muscle cell in normal situation
- (D) A and B
- (E) B and C

Answer (E)

(13) How does EPSP makes a neuron fire action potentials?

- (A) A neuron has thousands of EPSPs that can summate
- (B) Spatial and temporal summation of many EPSPs can produce a suprathreshold stimulus at the axon hillock
- (C) A single EPSP in neuron can be large enough to elicit AP if the synapse is located at the axon hillock.
- (D) A and B
- (E) A, B and C.

Answer (D)

(14) Botox (diluted botulinum toxin) blocks the action of acetylcholine at NMJ by:

- (A) blocking Na⁺ channels
- (B) blocking acetylcholine receptors
- (C) inactivating the SNARE proteins responsible for the fusion of synaptic vesicles with the presynaptic membrane.
- (D) A and B
- (E) A, B and C

Answer (C)

(15) Acetylcholine is sequestered into synaptic vesicles by:

- (A) choline esterase
- (B) acetylcholine receptors
- (C) vesicular acetylcholine transporter
- (D) choline acetyltransferase
- (E) plasma membrane acetylcholine transporter

Answer (C)

(16) In the stretch reflex induced by a tendon tap,

- (A) Action potentials are fired if the generator potential is suprathreshold.
- (B) A DRG neuron directly synapses on the α -motor neuron that innervates the rectus femoris muscle.
- (C) An interneuron inhibits AP firing in the α -motor neuron that innervates the semitendinosus muscle.