

## Jerusalem Science Contest 5784

### Neuroscience

#### Test 3

#### Form – A

#### Answer Key

- 1) Where does an action potential begin?
  - a) Dendrite
  - b) Axon terminal
  - c) Synaptic vesicle
  - d) Axon hillock**
  
- 2) What element is not part of the chemical transmission of information across the synapse?
  - a) Vesicles
  - b) Neurotransmitter molecules
  - c) Neurotransmitter receptors
  - d) Myelin**
  
- 3) Which of the following is true regarding information transmission between neurons?
  - a) Electrical signals accomplish all information transmission.
  - b) Chemical signals are important because they move extremely quickly.
  - c) Chemical signals are exclusively inhibitory.
  - d) Information transmission requires both electrical and chemical mechanisms.**
  
- 4) What is the resting potential (voltage) of a normal neuron?
  - a) +120 mv
  - b) +70 mv
  - c) 0 mV
  - d) -70 mV**
  
- 5) Which membrane channel is most important for maintaining resting potential?
  - a) Ca channel
  - b) K channel
  - c) Na<sup>+</sup>/K<sup>+</sup> pump**
  - d) Chloride pump

6) Which of the following is characteristic of an action potential?

- a) **Propagates without need for energy input.**
- b) Slow conduction.
- c) Cannot occur without myelin.
- d) Can be triggered by any amount of change in membrane potential.

7) Which of the following are cheap (require no energy input)?

- a) Synaptic potential
- b) **Action potential**
- c) Repolarization
- d) Chemical transduction

8) What event triggers neurotransmitter release?

- a) Action potential
- b) Plasticity
- c) Synaptic potential
- d) **Ca<sup>2+</sup> influx**

9) Saltatory conduction is \_\_\_\_\_. (Fill in the blank)

- a) energy intensive.
- b) uncommon.
- c) slow.
- d) **dependent on the presence of myelin.**

10) How many synaptic potentials are required to produce an action potential?

- a) 0
- b) 1
- c) It depends on the threshold potential only.
- d) **It depends on the resting potential and the threshold potential.**

11) What happens to neurotransmitter molecules that do not bind to post-synaptic receptors?

- a) They flow away from the synapse.
- b) They degrade very rapidly.
- c) They are taken up and degraded by the post-synaptic cell.
- d) **They are taken up and recycled by the presynaptic cell.**

12) Which is a feature of long-term potentiation (LTP)?

- a) Only occurs in invertebrates and lower mammals.
- b) Is due to repeated action potentials.
- c) **Is due to repeated synaptic potentials.**
- d) Results in a decrease in the resting membrane potential (voltage).

- 13) How many synaptic connections are there on average for each neuron in the brain?
- a) 10
  - b) 100
  - c) 1000**
  - d) 100000
- 14) Which is true regarding neuron-to-neuron synaptic connections?
- a) Synaptic connections do not form after childhood brain development is complete.
  - b) Synaptic connections form by physiological changes only and do not involve structural change to neurons.
  - c) For synaptic connections to change, new neurons need to emerge.
  - d) Synaptic connection changes are the basis of learning and memory.**
- 15) How does the human brain differ from a computer?
- a) The human brain consumes much more energy than a high-performance computer.
  - b) The human brain can add memory without changing the number of neurons.**
  - c) Computers cannot recognize faces.
  - d) Both a computer and the human brain rely only on electrical signals to transmit information.
- 16) According to the Talmud, what is better for learning – to sleep at night or to learn at night?
- a) It is better to sleep at night and learn during the day.
  - b) It is better to learn at night, even though one's sleep will be curtailed.
  - c) It depends on the individual's physiological composition.
  - d) This is the subject of a dispute in the Talmud.**
- 17) What is the literal meaning of the phrase **תורה שבעל פה** in the first paragraph of the Shema, and what does the Talmud derive from this phrase?
- a) Literal meaning: You shall teach Torah to your children. The Talmud derives: The Torah shall be so sharp in your mouth that you won't hesitate to answer if someone asks you a question.**
  - b) Literal meaning: The Torah shall be so sharp in your mouth that you won't hesitate to answer if someone asks you a question. The Talmud derives: You shall teach Torah to your children.
  - c) Literal meaning: You shall teach Torah to your children. The Talmud derives: You shall teach Torah to students.
  - d) Literal meaning: You shall review your Torah learning constantly. The Talmud derives: You shall know every part of the Torah.
- 18) What are two primary ways to consolidate memory as described by the Talmud and commentaries, which neuroscientists now have some understanding of the underlying neurochemical processes and neuromolecular changes which they effect?
- a) Studying silently and superficially.
  - b) Amphetamines and methylphenidates.
  - c) Prayer and meditation.
  - d) Repetition and focused attention.**

- 19) According to the Talmud, you are likely to understand and remember the material you are studying better if:
- a) You are feeling really stressed out.
  - b) You study three hours straight without a break.
  - c) *You are in a good mood, and happy, calm, and relaxed.***
  - d) You fill the space around you with lots of distracting sounds and sights.
- 20) There is an allusion in the first two paragraphs of Shema to what two basic elements that strongly influence memory?
- a) *(1) The original context and state of mind in which one learns something; (2) Proactive review and repetition.***
  - b) (1) Prayer; (2) Meditation.
  - c) (1) Learning the material by oneself; (2) Learning the material with a study partner.
  - d) (1) Teaching the material to one's students; (2) Teaching the material to one's children.