



Jerusalem Science Contest 5784

Neuroscience

Test 1

Form - A

- 1) Which of the following characterizes the central vs. peripheral nervous system?
 - a) **Myelin is made by oligodendrocytes.**
 - b) Responsible for “Fight or Flight” responses.
 - c) Principally relates to unconscious and autonomic function.
 - d) Nerves within organs such as the skin and heart.

- 2) “Rest and Digest” refers to which of the following?
 - a) Increase in sweating.
 - b) Decrease in gut motility.
 - c) **Decrease in heart rate.**
 - d) Release of norepinephrine.

- 3) Which of the following is a reason that *C. elegans* is useful for studying the nervous system?
 - a) Its brain structure is similar to the human hindbrain.
 - b) It can be trained to follow simple commands.
 - c) Its nervous system is extremely complex and has not been fully characterized.
 - d) **Its cellular neuronal function is highly similar to the mammalian nervous system**

- 4) The somatic nervous system is _____.
 - a) The main substrate of cognition.
 - b) Part of the central nervous system.
 - c) Part of the autonomic nervous system.
 - d) **Important for fine motor coordination**

- 5) The sympathetic nervous system _____.
 - a) Is activated for hibernation in bears.
 - b) Releases acetylcholine.
 - c) **Affects the adrenal glands.**
 - d) Is part of the cerebellum.

- 6) To create a synapse, which of the following parts of the neuron can form a connection?
- a) Dendrites and dendrites.
 - b) Axons and dendrites.
 - c) Axons and axons.
 - d) All of the above.**
- 7) Which organ is part of the nervous system?
- a) Brain.
 - b) Heart.
 - c) Skin.
 - d) All of the above.**
- 8) A mouse is bred to contain an altered gene (called a transgenic mouse) that alters the mouse's response to stress. Where can this gene be found?
- a) Cerebral cortex.
 - b) Cerebellum.
 - c) Adrenal gland.
 - d) All of the above.**
- 9) MRI is characterized by which of the following?
- a) Requires cutting the brain into slices.
 - b) Should not be performed on children due to X-ray radiation.
 - c) Creates images that show structure and can also assess function.**
 - d) Is most useful for assessing neurons at the cellular level.
- 10) Optogenetics entails which of the following?
- a) Viewing genes through a powerful microscope.
 - b) Splicing new DNA into a living adult animal.
 - c) The study of genes that determine visual acuity.
 - d) Activating a gene at a specific brain location through an implanted light source.**
- 11) Reasoning is made possible to the greatest extent by _____.
- a) Brain networks.**
 - b) The convoluted cerebral cortex.
 - c) Brainstem nuclei.
 - d) The temporal lobe.
- 12) Which of the following are true of adult human brain structure.
- a) New cerebral neurons are born more slowly than in infancy.
 - b) Neural circuits and network connections are fixed at the end of development around age 20.
 - c) Learning and memory entail structural changes to neurons.**
 - d) Once structural changes are in place, they are not reversible.

- 13) Electrical compared to chemical transmission of information is _____.
- a) Slower
 - b) Can occur within and between neurons.
 - c) Cannot directly cross the synapse.**
 - d) Generally, is only possible over short distances.
- 14) The cerebellum is part of the _____.
- a) Autonomic nervous system because it mediates unconscious motor function like balance.
 - b) Central nervous system.**
 - c) Limbic system
 - d) Somatic nervous system.
- 15) Electrophysiology is _____.
- a) Useful for in vitro circuit analysis.**
 - b) Unable to detect brain activity in adult humans due to the thickness of the skull.
 - c) Requires insertion of an electrode into neural tissue.
 - d) Directly detects chemical transmission at the synapse.
- 16) What is one reason, from a Torah perspective, to learn about the development, structure, and functioning of the brain and central nervous system (according to the Rambam)?
- a) To know how to be better neurosurgeons.
 - b) To know why men wear kippahs on their heads.
 - c) It helps us learn Torah better.
 - d) To enhance our appreciation of God and our love for Him.**
- 17) To an objective student of science, do the modern discoveries in brain science and microbiology contradict, support, or have no impact on the notion of an omniscient Creator?
- a) The way the brain works is so random and haphazard that there is no evidence to support an omni-intelligent Creator from scientific discoveries.
 - b) The way the brain works is so immensely complex and so exquisitely designed that it points strongly to an omni-intelligent Creator.**
 - c) The answer to this question depends on one's preconceived biases
 - d) Both b and c.**
- 18) What is one thing that a Jewish student of science should not lose sight of when studying natural science?
- a) Not to spend too much time on secular studies.
 - b) The usefulness of science in our lives.
 - c) The striking purposefulness of every phenomenon.**
 - d) How every piece of information about the natural world is found in the Torah.

19) What Torah responsibilities does a greater understanding of how the brain functions enable us to fulfill?

- a) It helps us know how to better take care of our physical selves.
- b) It gives us a more positive frame of mind for fulfilling mitzvot such as caring for the sick, respecting the aged, honoring our parents.
- c) It helps us fulfill the mitzvah to love God.
- d) All of the above.**

20) Is taking care of our bodies a mitzvah?

- a) It is a mitzvah, but there is some discussion about whether it is a rabbinical mitzvah or a Torah mitzvah.**
- b) All opinions say that it is a rabbinically-decreed mitzvah with no source in the Torah.
- c) All opinions say that it is a mitzvah mandated by the Torah.
- d) It is not a mitzvah, but it is a smart thing to do.