

CHAPTER 2
LEARNING AND THE BRAIN

Multiple Choice Questions

1. Which one of the following is the best example of the *central nervous system* (rather than peripheral nervous system) at work?
 - a. Parts of the hindbrain are involved in regulating heart rate.
 - b. Cells in the retina at the back of the eye transmit information about light.
 - c. Some cells in the nose respond to certain kinds of chemicals.
 - d. Some cells in the skin are sensitive to heat or cold.

2. Which one of the following statements most accurately describes a neuron's *threshold of excitation*?
 - a. A neuron responds when it is stimulated by some of its neighboring neurons, but not when it is stimulated by other neighbors.
 - b. A neuron fires only when its electrical charge reaches a particular level.
 - c. A neuron is receptive to stimulation from other neurons only at points where there are gaps in its myelin sheath.
 - d. A neuron will fire at a maximum rate of no more than once every three seconds.

3. Which one of the following best describes how *neurons* transmit messages to one another?
 - a. By stimulating the growth of surrounding glial cells
 - b. By attaching themselves to the same terminal buttons
 - c. By fusing the axon of one with a dendrite of the other
 - d. By sending chemical substances across a tiny gap between them

4. Which one of the following is the best example of a *reflex* as psychologists define the term?
 - a. Going to sleep when you are tired
 - b. Feeling sad when a close relative dies
 - c. Pulling your foot away from a painful object
 - d. Jumping up and down for joy when you get a good grade

5. Three of the following describe methods what researchers commonly use to determine how the human brain probably functions. Which one is *not* a commonly used method to study the brain?
 - a. Documenting the behaviors of people with various kinds of brain injuries
 - b. Recording brain activity through PET scans, CAT scans, and similar technologies
 - c. Measuring the levels of various hormones and other substances in the blood
 - d. Removing a certain part of an animal's brain and observing the animal's subsequent behaviors

6. After a severe head injury, Mary has exceptional difficulty setting goals and in other ways planning her actions. Without knowing anything else about Mary's injury, you might reasonably conclude that it affected her:
 - a. forebrain
 - b. midbrain
 - c. hindbrain
 - d. reticular formation

7. Given how the left and right hemispheres of the brain typically specialize, which one of the following activities would be most heavily dependent on the *right* hemisphere?
 - a. Writing a speech for a political campaign
 - b. Following the logic of a persuasive argument
 - c. Solving for x in a complex algebraic equation
 - d. Recognizing human forms in a Picasso painting

8. Given the roles that the right hemisphere typically plays in language comprehension, which one of the following tasks would rely most heavily on the right hemisphere?
 - a. Hearing the rhyme in the words *hypocrisy* and *democracy*
 - b. Writing precise definitions of abstract words such as *hypocrisy* and *democracy*
 - c. Realizing that "That blonde is really hot" has as least two possible meanings
 - d. Translating Leo Tolstoy's novel *War and Peace* into English

9. Given what psychologists believe to be true about how information is typically stored in the brain, how is the concept *dog* probably represented in your brain?
- As a single neuron located in the prefrontal cortex
 - As a network of neurons spread across multiple brain regions
 - As a cluster of interconnected neurons located in the left parietal lobe
 - As a cluster of interconnected neurons located in one of the occipital lobes
10. Which one of the following best describes the growth of neurons during the prenatal period?
- An overabundance of neurons emerges early in prenatal development, but about half of the neurons die before birth.
 - Neurons continue to be generated at a rapid rate throughout the last six months of the prenatal period.
 - Neurons begin to develop in the fifth month of pregnancy, and they proliferate rapidly during the third trimester.
 - Neurons that will support basic physiological functioning appear in the first two months after conception; those that will be responsible for higher-level thinking processes don't appear until two or three months before birth.
11. In the human brain, a great deal of *synaptic pruning* occurs in early childhood. This pruning appears to be:
- The unfortunate result of insufficiently stimulating home environments
 - An adaptive process that allows children to deal more efficiently with their environment
 - Due to an imbalance of important nutrients, and especially to low levels of the B vitamins in many children's diets
 - Reflective of the fact that the forebrain is slowly taking over responsibility for functions that have previously been regulated by the hindbrain and midbrain
12. As children grow older, many of their neurons begin to transmit messages more rapidly than they did in the early years of life, thanks to:
- synaptic pruning
 - synaptogenesis
 - myelination
 - maturation of the limbic system

13. During the elementary and secondary school years, much of the brain's development occurs in regions of the brain that are largely responsible for
- thinking and reasoning
 - generation of emotional responses
 - muscular strength and coordination
 - making discriminations among highly similar stimuli
14. John is an adolescent who makes impulsive decisions (e.g., ditching school) and engages in risky behavior (e.g., driving well over the speed limit). His behavior can best be explained by which of the following?
- Adolescents have limited concepts of consequences and punishment.
 - Adolescents' brain stems are still not fully developed, and will not be until middle adulthood.
 - Adolescents' pre-frontal cortices are still not fully developed and will not be until their late teens and early twenties.
 - During adolescence, synaptic pruning has stopped.
15. According to the textbook, which one of the following conclusions is most true regarding factors that influence brain development?
- Genetic factors have the strongest influence on brain development, particularly later in life.
 - Environmental factors and people's experiences have the strongest influence on brain development in middle childhood.
 - Together, brain development is shaped by genetic and environmental factors throughout the life span.
 - Environmental factors are particularly influential in abnormal brain development.
16. Three of the following statements are consistent with research findings about factors that influence brain development. Which statement has *not* been supported by research?
- Genetic factors predispose some people to learning difficulties or mental illness.
 - High levels of alcohol consumption during pregnancy can lead to mental retardation.
 - High levels of toxic substances (e.g., lead, pesticides) have their greatest negative impact after puberty.
 - Opportunities to learn certain skills may lead to detectable differences in brain structures or patterns of brain activation.

17. In which one of the following situations should we be most concerned about missing a *critical period* in a person's development?
- Rachel is born with a cataract in her left eye that is surgically removed when she is 8 years old.
 - Phoebe doesn't learn how to write until she is 12 years old.
 - Although Ross knows how to count, he gets no formal instruction in mathematics until he is 15.
 - Joey has his first tennis lesson when he is 25.
18. Which one of the following best exemplifies *experience-expectant plasticity*?
- Learning how to play the guitar
 - Mastering one's native language
 - Understanding abstract ideas in philosophy
 - Applying principles of psychology to real-world settings
19. Which one of the following best exemplifies *experience-dependent plasticity*?
- Hearing subtle differences in similar-sounding words
 - Learning how to pronounce words like a native speaker
 - Learning syntactical structures of one's native language
 - Learning how to read
20. Which one of the following research findings is most consistent with the concept of *core knowledge* as described in the textbook?
- Children must have basic knowledge of numbers and counting before they can master arithmetic operations such as addition and multiplication.
 - Some motor skills are prerequisites for others; for example, children must learn how to walk before they can learn how to run or skip.
 - Some linguistic knowledge is prerequisite to other knowledge; for example, children must know how to read before they can learn how to write.
 - Very young infants appear to have more knowledge of the physical world than they could have acquired from their own, limited experiences with objects.

21. Which one of the following best describes *mirror neurons*?
- They are pairs of neurons that have identical functions on opposite sides of the cortex.
 - They are the primary reason why infants can recognize their own reflections as early as 3 months of age.
 - They fire when a person either makes a particular response or observes someone else make that response.
 - They are the only kinds of neurons that are consistently found in all primate species.
22. Which one of the following best describes psychologists' current beliefs about the brain and learning?
- Learning involves changes in synapses and possibly also involves the growth of new neurons and astrocytes.
 - Large doses of certain vitamins promote brain growth and lead to more rapid learning.
 - Left-hemisphere-dominant individuals are, on average, more effective learners than right-hemisphere-dominant individuals.
 - The brains of rapid learners are about 20% larger than the brains of slower learners.
23. Naomi wakes up several hours after a severe blow to her head has rendered her unconscious. She can remember nothing about events leading up to the incident, reflecting the importance of _____ in learning and memory.
- neurogenesis
 - consolidation
 - a critical period
 - the corpus callosum
24. According to the textbook, which one of the following conclusions is most warranted from research on brain development?
- To become truly skilled in such domains as art and music, children should begin systematic instruction in these domains before the age of five.
 - The ability to think abstractly depends on the development of many synaptic connections during the first five years of life.
 - Children probably won't acquire the basic skills essential to succeed in the adult world (e.g., reading, writing, math) unless they begin developing those skills in the early elementary grades at the latest.
 - Classroom experiences can significantly enhance people's cognitive development throughout the elementary, secondary, and post-secondary school years.

Essay Questions

1. The textbook describes five general research methods that scientists use to determine how the brain functions. In three short paragraphs, describe *three* of them.
2. Several teachers tell you that they are “teaching to students’ right brains” by spending a lot of time on painting, map interpretation, geometry, and other highly visual and/or spatial activities. Critique their claim using what you have learned about how the human brain functions.
3. Someone tries to convince you that parents should put their children in enriching preschool environments by their second birthday at the latest. How would you respond to this individual? In your response:
 - a. State whether you agree or disagree with the person.
 - b. Defend your position given recent findings about brain development. Include the following concepts in your discussion:
 - i. synaptogenesis
 - ii. synaptic pruning
 - iii. experience-expectant and experience-dependent plasticity