

## Chapter 02: The Neural Basis for Cognition

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### MULTIPLE CHOICE

1. Which of the following statements is LEAST likely to be true of a person with Capgras syndrome?
- She thinks that her mother has been replaced by a look-alike alien.
  - She cannot recognize that her father looks like her father.
  - She also has Alzheimer's syndrome.
  - She has no warm sense of familiarity when she sees a close friend.

ANS: B                      DIF: Moderate              REF: Explaining Capgras Syndrome  
OBJ: 2.1                      MSC: Applying

2. Some researchers explain Capgras syndrome as
- a simple failure of visual recognition.
  - the result of a disconnection between a cognitive appraisal and a sense of familiarity.
  - a subtype of schizophrenia.
  - a failure of long-term memory, because patients cannot remember what their own close family members look like.

ANS: B                      DIF: Moderate              REF: The Neural Basis for Capgras Syndrome  
OBJ: 2.1                      MSC: Understanding

3. Neuroimaging techniques such as PET suggest a link between Capgras syndrome and abnormalities in all of the following brain regions EXCEPT the
- prefrontal cortex.
  - amygdala.
  - temporal lobe.
  - fusiform face area.

ANS: D                      DIF: Moderate              REF: The Neural Basis for Capgras Syndrome  
OBJ: 2.1                      MSC: Analyzing

4. For most people, encountering a family member who looks a little bit different will elicit a response like "He must have gotten a haircut!" However, that same experience will elicit a response like \_\_\_\_\_ from someone with Capgras syndrome.
- "He lost weight!"
  - "He is mad at me."
  - "He is an imposter!"
  - "He looks like a hat!"

ANS: C                      DIF: Moderate              REF: The Neural Basis for Capgras Syndrome  
OBJ: 2.1                      MSC: Applying

5. Capgras syndrome suggests there are two parts to recognition. These parts are
- factual and familiar.
  - factual and emotional.
  - visual and factual.
  - visual and auditory.

ANS: B                      DIF: Moderate              REF: What Do We Learn from Capgras Syndrome?  
OBJ: 2.1                      MSC: Understanding

6. Capgras syndrome provides an illustration of several important themes in Chapter 2. All of the following are true of Capgras EXCEPT
- damage to a specific part of the brain is likely to produce specific symptoms.
  - the brain is interconnected so that many systems interact.
  - cognitive disorders often co-occur, such as Alzheimer's syndrome and Capgras syndrome.
  - damage to the amygdala will result in an inability to recognize imposters.

ANS: D                      DIF: Moderate              REF: What Do We Learn from Capgras Syndrome?  
OBJ: 2.2                      MSC: Evaluating

7. Capgras syndrome contributes to our understanding of cognition in each of the following ways EXCEPT the role of
- the temporal lobe in memory.
  - the amygdala in people without Capgras syndrome.
  - the frontal lobe in schizophrenia.
  - visual area V1.

ANS: D                      DIF: Difficult              REF: What Do We Learn from Capgras Syndrome?  
OBJ: 2.2                      MSC: Evaluating

8. Capgras syndrome and other cognitive disorders are useful because they
- provide information about normal cognitive functioning.
  - suggest cognition is an interesting topic.
  - provide evidence that people with Capgras syndrome need medication.
  - show that all brain damage is irreversible.

ANS: A                      DIF: Difficult              REF: What Do We Learn from Capgras Syndrome?  
OBJ: 2.2                      MSC: Analyzing

9. Which of the following statements about Phineus Gage is FALSE?
- He had Capgras syndrome.
  - A rod went through his face and head, removing part of his frontal lobe.
  - His personality changed after his trauma.
  - He was able to perform basic cognitive tasks (talking, remembering, etc.) after his trauma.

ANS: A                      DIF: Moderate              REF: The Study of the Brain  
OBJ: 2.2                      MSC: Understanding

10. Damage to the brain can be caused in many ways, but in general the damage is referred to as a
- stroke.
  - lesion.
  - syndrome.
  - problem.

ANS: B                      DIF: Easy                      REF: Data from Neuropsychology  
OBJ: 2.2                      MSC: Understanding

11. Among its other functions, the amygdala seems to serve as a(n)
- important relay station between the eye and occipital cortex.
  - storage location for information received from the skin.
  - “emotional evaluator” or threat detector.
  - “index” for locating memories in the brain.

ANS: C                      DIF: Easy                      REF: The Neural Basis for Capgras Syndrome  
OBJ: 2.4                      MSC: Understanding

12. Mike has damage to his hindbrain. He is likely to experience problems with which set of behaviors?
- rhythm of breathing, level of alertness, and posture
  - complex thought and long-term memory
  - planned motor activity
  - perception and visual imagery

ANS: A                      DIF: Easy                      REF: Hindbrain, Midbrain, Forebrain  
OBJ: 2.4                      MSC: Applying

13. Lisa has recently suffered a brain injury. Her symptoms include deficits in coordination and interpretation of pain. Which structure is most likely damaged?
- a. primary motor area
  - b. midbrain
  - c. forebrain
  - d. hindbrain

ANS: B                      DIF: Moderate                      REF: Hindbrain, Midbrain, Forebrain  
OBJ: 2.4                      MSC: Applying

14. The cortex makes up the surface of what brain structure?
- a. hindbrain
  - b. midbrain
  - c. thalamus
  - d. forebrain

ANS: D                      DIF: Easy                      REF: Hindbrain, Midbrain, Forebrain  
OBJ: 2.4                      MSC: Remembering

15. Damage to the \_\_\_\_\_ is likely to cause problems with precise eye movements.
- a. forebrain
  - b. midbrain
  - c. hindbrain
  - d. amygdala

ANS: B                      DIF: Moderate                      REF: Hindbrain, Midbrain, Forebrain  
OBJ: 2.4                      MSC: Analyzing

16. Which of the following is included in the limbic system?
- a. thalamus
  - b. amygdala
  - c. cerebellum
  - d. hypothalamus

ANS: B                      DIF: Easy                      REF: Subcortical Structures  
OBJ: 2.4                      MSC: Remembering

17. Commissures, including the corpus callosum, are
- a. blood vessels that carry blood to all areas of the brain.
  - b. brain areas associated with various types of sensory information.
  - c. pockets of oxygen found throughout the brain.
  - d. thick bundles of fibers that allow communication between the brain's hemispheres.

ANS: D                      DIF: Easy                      REF: Subcortical Structures  
OBJ: 2.4                      MSC: Remembering

18. Most of the brain's structures are hidden deep inside the \_\_\_\_\_, which is the outer, visible layer.

- a. cerebellum
- b. cortex
- c. midbrain
- d. hindbrain

ANS: B                      DIF: Moderate                      REF: Hindbrain, Midbrain, Forebrain  
OBJ: 2.5                      MSC: Applying

19. Which of the following structures is NOT visible when viewing an image of an intact brain?
- a. cerebellum
  - b. cortex
  - c. primary motor cortex
  - d. amygdala

ANS: D                      DIF: Moderate                      REF: Hindbrain, Midbrain, Forebrain  
OBJ: 2.5                      MSC: Analyzing

20. Which lobe or cortex is farthest from the cerebellum?
- a. frontal
  - c. occipital



ANS: C                      DIF: Moderate      REF: Lateralization  
OBJ: 2.6                    MSC: Remembering

27. A patient might elect to have split-brain surgery, which involves
- severing the corpus callosum.
  - removing the amygdala.
  - removing one hemisphere of the brain.
  - removing a section of the frontal lobe.

ANS: A                      DIF: Moderate      REF: Lateralization  
OBJ: 2.6                    MSC: Remembering

28. The corpus callosum is a large
- muscle.
  - neuron.
  - commissure.
  - damaged area of the brain.

ANS: C                      DIF: Moderate      REF: Lateralization  
OBJ: 2.6                    MSC: Applying

29. Split-brain patients benefit from the procedure in the form of fewer seizures. How has cognitive psychology benefited?
- This procedure has led to the well-supported notion that someone can be “left-brained” or “right-brained.”
  - Research with these patients suggests that there is not significant localization of function in the brain.
  - Research with these patients suggests that someone cannot live without an intact corpus callosum, indicating its importance in survival and functioning.
  - The procedure indicates that you can cause damage to the brain with no adverse cognitive effects.

ANS: D                      DIF: Moderate      REF: Lateralization  
OBJ: 2.6                    MSC: Analyzing

30. Transcranial magnetic stimulation (TMS) uses a strong magnetic pulse to
- record the amount of glucose a specific brain region used during a cognitive task.
  - measure the blood flow using blood oxygenation level dependent (BOLD) signals.
  - produce a temporary disruption to the brain area, and thus brain function, where it is applied.
  - create a detailed “map” of the different brain areas.

ANS: C                      DIF: Moderate      REF: Data from Neuroimaging  
OBJ: 2.7                    MSC: Understanding

31. Researchers using functional magnetic resonance imaging (fMRI) find activity in the fusiform face area (FFA) when participants are viewing faces. This means that FFA
- is responsible for recognizing faces.
  - is necessary to recognizing faces.
  - activity is correlated with recognizing faces.
  - has no role in recognizing faces.

ANS: C                      DIF: Difficult      REF: Data from Neuroimaging  
OBJ: 2.7                    MSC: Evaluating

32. Magnetic resonance imaging (MRI) and fMRI
- are less useful than other types of neuroimaging for the study of brain function.

- b. create a three-dimensional representation of the brain's tissue.
- c. are useful only for studying features on the outer surface of the brain.
- d. make self-report data unnecessary.

ANS: B                      DIF: Easy                      REF: Data from Neuroimaging  
OBJ: 2.7                      MSC: Understanding

33. A number of techniques have been developed that allow us to examine the moment-by-moment activity levels of specifically defined brain areas. These techniques are called
- a. fMRI
  - b. neuroimaging techniques.
  - c. chronometric techniques.
  - d. psychometric assessment.

ANS: B                      DIF: Easy                      REF: Data from Neuroimaging  
OBJ: 2.7                      MSC: Understanding

34. A CT or computerized axial tomography scan
- a. can only be performed on a cadaver.
  - b. uses X-rays to study the living brain's anatomy.
  - c. is primarily useful for measuring blood flow in the brain.
  - d. can detect the activity taking place in different brain areas in real time.

ANS: B                      DIF: Easy                      REF: Data from Neuroimaging  
OBJ: 2.7                      MSC: Remembering

35. Positron emission tomography (PET) scans show
- a. minute details of brain anatomy.
  - b. what a participant is thinking at the moment the test is taken.
  - c. brain areas that are currently consuming a particularly high level of glucose.
  - d. whether a participant is learning something new or remembering prior learning.

ANS: C                      DIF: Easy                      REF: Data from Neuroimaging  
OBJ: 2.7                      MSC: Remembering

36. Patrick was in a car accident and hit his head on the dashboard. The emergency room doctors are concerned that he may have sustained a traumatic brain injury. Which of the following methods are they most likely to use to confirm or disprove their diagnosis?
- a. TMS
  - b. fMRI
  - c. EEG
  - d. MRI

ANS: D                      DIF: Moderate                      REF: Data from Neuroimaging  
OBJ: 2.7                      MSC: Applying

37. The electroencephalogram (EEG) provides an estimate of brain activity by measuring
- a. glucose consumption.
  - b. blood flow.
  - c. neurotransmitter release.
  - d. electrical signals produced by neurons.

ANS: D                      DIF: Moderate                      REF: Data from Electrical Recording  
OBJ: 2.7                      MSC: Remembering

38. Researchers have used fMRI to investigate activation in the FFA and the parahippocampal place area (PPA). When participants are shown a picture of a face to one eye and a picture of a house to the other eye (producing binocular rivalry), we expect to see
- a. no increase in activation in either the FFA or the PPA relative to a baseline.
  - b. equal activation in the FFA and the PPA.

- c. only activation in the brain region linked to the picture in the dominant eye (e.g., if a picture of a face is presented to the dominant eye, then only the FFA will show increased activation).
- d. an increase in activation in the FFA when the participant is consciously aware of the face and similarly increased activation in the PPA when the participant is consciously aware of the house.

ANS: D                      DIF: Moderate                      REF: The Power of Combining Techniques  
OBJ: 2.7                      MSC: Analyzing

39. Dr. Hout has fMRI evidence about the role of the FFA in visual processing. What should he do next?
- a. acquire evidence from another method, like CT or TMS
  - b. assume that the role of the FFA is completely understood
  - c. nothing; one source of evidence is sufficient.
  - d. assume his results are flawed and do another fMRI study

ANS: A                      DIF: Moderate                      REF: The Power of Combining Techniques  
OBJ: 2.7                      MSC: Applying

40. The primary motor projection area is located
- a. in the cerebellum.
  - b. in the occipital cortex.
  - c. toward the rear of the frontal lobe.
  - d. in the midbrain.

ANS: C                      DIF: Easy                      REF: Motor Areas                      OBJ: 2.8  
MSC: Remembering

41. If a researcher applies mild electric current to a specific area of an animal's right hemisphere primary motor projection area, which of the following is likely to happen?
- a. a specific movement of a body part on the right side of the animal
  - b. a specific movement of a body part on the left side of the animal
  - c. a chaotic movement of the entire animal
  - d. no movement at all

ANS: B                      DIF: Moderate                      REF: Motor Areas                      OBJ: 2.8  
MSC: Applying

42. The auditory cortex follows the principle of contralateral control. Thus, the
- a. right temporal lobe receives most of its input from the left ear.
  - b. right temporal lobe receives most of its input from the right ear.
  - c. right temporal lobe receives equal input from both ears.
  - d. information received by the right temporal lobe depends on whether the listener favors his or her right or left ear.

ANS: A                      DIF: Easy                      REF: Sensory Areas  
OBJ: 2.8                      MSC: Applying

43. The primary motor projection area forms a "map" of the body and the projections control movement to specific areas of the body. The amount of cortical tissue dedicated to different parts of the body correlates with
- a. the size of the body part.
  - b. the distance of the body part from the brain.
  - c. the precision of movement for the body part.

d. The cortical area does not vary; it is the same for all body parts.

ANS: C                      DIF: Moderate              REF: Sensory Areas  
OBJ: 2.8                      MSC: Analyzing

44. Olivia has sustained damage to the prefrontal area. As a result, she is most likely to have
- neglect syndrome.
  - a variety of problems, including problems planning and implementing strategies.
  - difficulties exclusively with memory.
  - primarily language problems.

ANS: B                      DIF: Moderate              REF: Association Areas  
OBJ: 2.8                      MSC: Applying

45. A patient with visual agnosia will probably show an inability to
- remember a list of words heard 1 hour before.
  - detect brief flashes of light.
  - recall the color of familiar objects (e.g., that stop signs are red).
  - identify common objects in plain view.

ANS: D                      DIF: Easy                      REF: Association Areas  
OBJ: 2.8                      MSC: Applying

46. Ben and Quinn both have lesions in their left frontal lobes. Ben has trouble producing speech; Quinn has difficulties comprehending speech. Both Ben and Quinn are likely to receive a diagnosis of
- neglect syndrome.
  - apraxia.
  - agnosia.
  - aphasia.

ANS: D                      DIF: Moderate              REF: Association Areas  
OBJ: 2.8                      MSC: Applying

47. Motor and sensory cortices combined make up what portion of the brain?
- less than 10%
  - roughly 25%
  - just over 50%
  - nearly 85%

ANS: B                      DIF: Moderate              REF: Association Areas  
OBJ: 2.8                      MSC: Remembering

48. Communication between neurons is \_\_\_\_\_, while communication within a neuron is \_\_\_\_\_.
- electrical; chemical
  - chemical; electrical
  - electric; neurotransmitter-based
  - simple; difficult

ANS: B                      DIF: Easy                      REF: Neurons and Glia  
OBJ: 2.9                      MSC: Understanding

49. A neuron is
- a group of cells specialized for a particular type of information storage.
  - one of the fibers connecting the eye to the visual cortex.
  - an individual cell within the nervous system.
  - a region within the brain dedicated to a single function.

ANS: C                      DIF: Easy                      REF: Neurons and Glia  
OBJ: 2.9                      MSC: Remembering

50. Which of the following is NOT a primary function of glial cells?

- a. provide support for neurons
- b. facilitate the development of the nervous system
- c. release neurotransmitters
- d. clean up waste

ANS: C                      DIF: Moderate              REF: Neurons and Glia  
 OBJ: 2.9                      MSC: Evaluating

51. Once a cell fires, the part of a neuron that transmits information to another location is the
- a. dendrite.
  - b. cell body.
  - c. axon.
  - d. nucleus.

ANS: C                      DIF: Moderate              REF: Neurons and Glia  
 OBJ: 2.9                      MSC: Understanding

52. The \_\_\_\_\_ contains the machinery necessary to keep the cell alive and functioning properly.
- a. cell body
  - b. dendrite
  - c. axon
  - d. myelin

ANS: A                      DIF: Easy                      REF: Neurons and Glia  
 OBJ: 2.9                      MSC: Remembering

53. Complete the analogy: Incoming is to outgoing as \_\_\_\_\_ is to \_\_\_\_\_.
- a. dendrite; cell body
  - b. dendrite; axon
  - c. axon; cell body
  - d. cell body; axon

ANS: B                      DIF: Moderate              REF: Neurons and Glia  
 OBJ: 2.9                      MSC: Analyzing

54. Which of the following statements about neurons is FALSE?
- a. Signals are processed by the cell body of a neuron.
  - b. A neuron can have many dendrites.
  - c. Neurons have one basic shape.
  - d. The axon of one neuron can communicate with the dendrite of another neuron.

ANS: C                      DIF: Moderate              REF: Neurons and Glia  
 OBJ: 2.9                      MSC: Analyzing

55. Neuron A communicates with neuron B. The \_\_\_\_\_ of neuron A forms a synapse with the \_\_\_\_\_ of neuron B.
- a. cell body; soma
  - b. axon terminal; axon terminal
  - c. axon terminal; dendrite
  - d. soma; dendrite

ANS: C                      DIF: Moderate              REF: Neurons and Glia  
 OBJ: 2.9 | 2.10              MSC: Understanding

56. A synapse is
- a. a message sent from one neuron to another.
  - b. part of a neuron's cell body.
  - c. made up of the end of one neuron's axon, another neuron's receiving membrane, and the gap between these two.
  - d. the name of the electric signal that occurs when a cell reaches its threshold.

ANS: C                      DIF: Easy                      REF: The Synapse      OBJ: 2.9  
 MSC: Remembering

57. A neuron's initial, internal response to an incoming signal can vary in size. The ultimate, external response of the cell, however, does not vary in size. If the signal is sent, it is always of the same magnitude. This effect is called the
- whole-firing potential.
  - all-or-none law.
  - uniform response law.
  - threshold potential.

ANS: B                      DIF: Easy                      REF: The Synapse    OBJ: 2.9  
MSC: Understanding

58. Neuron X sends a signal that is picked up and processed by Neuron Y. This between-cell communication occurs via
- chemical transmission between Neuron X and Neuron Y.
  - electrical stimulation of Neuron Y by Neuron X.
  - fibers that connect Neuron X and Neuron Y.
  - We don't know how it happens.

ANS: A                      DIF: Moderate                      REF: The Synapse    OBJ: 2.10  
MSC: Applying

59. One of the disadvantages of synaptic communication is that it takes time for chemicals to pass from one side of the synapse to another. Which of the following is a benefit of synaptic transmission?
- It allows our nervous system to compare multiple signals from many sources.
  - Chemicals in our food can be broken down to influence between-cell communication.
  - It is simple, because each neuron can only receive signals from a single neuron.
  - Chemicals are more reliable than electrical energy.

ANS: A                      DIF: Moderate                      REF: The Synapse    OBJ: 2.10  
MSC: Evaluating

60. At the synapse, a neurotransmitter is released by the \_\_\_\_\_ and could bind to the \_\_\_\_\_.
- vesicle; presynaptic membrane
  - vesicle; receptor site
  - receptor; presynaptic membrane
  - receptor; vesicle

ANS: B                      DIF: Moderate                      REF: The Synapse    OBJ: 2.10  
MSC: Understanding

## ESSAY

- Describe Capgras syndrome and one possible explanation (physiological or cognitive) for the disorder. What does this disorder tell us about the interactive nature of the brain?

ANS:  
Answers will vary.

DIF: Difficult                      REF: The Neural Basis for Capgras Syndrome  
OBJ: 2.1                      MSC: Understanding

- As it pertains to the development and testing of theories, what are the benefits of studying neuropsychology and neuroscience for cognitive psychologists?

ANS:

Answers will vary.

DIF: Moderate      REF: The Power of Combining Techniques  
OBJ: 2.2 | 2.7      MSC: Evaluating

3. Is it fair to say that someone is “left-brained” or “right-brained”? Why or why not? Give examples to support your answer.

ANS:  
Answers will vary.

DIF: Moderate      REF: Lateralization      OBJ: 2.3 | 2.4  
MSC: Evaluating

4. Explain the relevance of split-brain patients in psychology by answering the following questions.
- What area of the brain is lesioned in these patients? Why do these patients elect to have this surgery?
  - How does behavior change after the surgery? How does it stay the same?
  - What have we learned about the brain and behavior as a result of this procedure?

ANS:  
Answers will vary.

DIF: Difficult      REF: Lateralization      OBJ: 2.6  
MSC: Analyzing

5. Compare and contrast the use of fMRI and TMS and describe their applications in psychology. What sort of information does each approach give us? Which technique can be used to make causal statements about the link between brain activity and behavior?

ANS:  
Answers will vary.

DIF: Difficult      REF: Data from Neuroimaging      OBJ: 2.7  
MSC: Evaluating

6. Evaluate the use of fMRI as a way to gather information about activity in the brain. What are the advantages and shortcomings of this approach?

ANS:  
Answers will vary.

DIF: Moderate      REF: Association Areas      OBJ: 2.7  
MSC: Evaluating

7. Judy has sustained damage to her visual association area, but not her primary association area. Describe the behavioral changes you would expect to see, given this trauma. What behaviors or mental processes would not be affected?

ANS:  
Answers will vary.

DIF: Moderate      REF: Association Areas      OBJ: 2.8  
MSC: Applying

8. Describe the relationship between cortical area in primary somatosensory cortex and corresponding surface area of the body part. Name two parts of the body that have surprisingly large cortical representations and two that have small representations.

ANS:

Answers will vary.

DIF: Moderate      REF: Association Areas      OBJ: 2.8  
MSC: Understanding

9. Explain how a signal would be processed and sent through a neuron. Include in your answer a description of the relevant components in the cell.

ANS:

Answers will vary.

DIF: Moderate      REF: Neurons and Glia      OBJ: 2.9  
MSC: Applying

10. Imagine that Neuron X communicates with Neuron Y. Describe the process by which Neuron X can send a message to Neuron Y. What possible effects will this signal have on the firing of Neuron Y?

ANS:

Answers will vary.

DIF: Moderate      REF: Neurons and Glia      OBJ: 2.10  
MSC: Applying