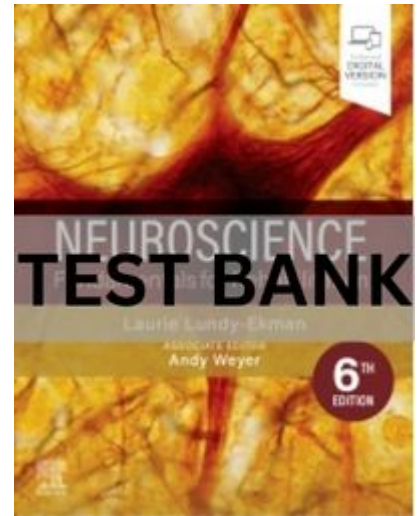


# Neuroscience 6th Edition Test Bank

## Chapter 01: Introduction to Neuroscience

### Lundy-Ekman: Neuroscience: Fundamentals for Rehabilitation, 6th Edition

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#### MULTIPLE CHOICE

1. Which one of the following studies is an example of systems level neuroscience?
  - a. A study investigating the action of the neurotransmitter dopamine in the temporal lobes of rodents
  - b. A study investigating the effect of impaired memory on walking performance
  - c. A study investigating how autonomic nerves influence baroreceptors in the vasculature
  - d. A study investigating the differential effects of vestibular and proprioceptive impairments on balance in those who have had a stroke

ANS: C

Systems level neuroscience is concerned with groups of cells in the nervous system that perform a common function and how these cells interact with other body systems. Other levels of neuroscience include the molecular level, which investigates the chemistry and physics involved in neural function; the cellular level, which examines the distinctions among different types of cells in the nervous system and how they function and communicate among themselves and among non-neural cells; the behavioral level, which examines the interactions among systems that influence behavior; and the cognitive level, which explores complex neurologic functions such as thinking, language, and memory.

2. Which of the following three systems extend into all regions of the nervous system?
  - a. Somatosensory, autonomic, and basal ganglia
  - b. Autonomic, somatosensory, and cognitive
  - c. Limbic, autonomic, and somatosensory
  - d. Somatosensory, motor, and autonomic

ANS: D

The three systems extend throughout the entire nervous system are the somatosensory system, conveying information from the skin and musculoskeletal system to the brain; the autonomic system, providing communication between the brain and smooth muscles, cardiac muscle, and glands; and the motor system, transmitting information from the brain to the skeletal muscles. The basal ganglia, cognitive, and memory systems are located entirely within the brain, and thus do not extend into the spinal and peripheral regions.

3. The peripheral nervous system includes which of the following?

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- a. Brainstem and spinal nerves
- b. Nerves, sensory receptors, and autonomic ganglia
- c. Groups of myelinated axons called capsules or tracts
- d. Only afferent neurons that convey information to the central nervous system

ANS: B

The peripheral nervous system consists of all nervous system structures outside of the skull and spinal column. Myelinated axons, the white matter of the peripheral nervous system, are grouped together in nerves. Peripheral nerves convey both afferent and efferent information to and from the central nervous system. Collections of autonomic cell bodies, or gray matter, located in the periphery are termed ganglia.

4. A \_\_\_\_\_ is a non-neuronal cell that provides services for neurons.
  - a. dendrite
  - b. axon
  - c. glial cell
  - d. soma

ANS: C

Glial cells are non-neuronal cells that provide services for neurons.

5. The \_\_\_\_\_ is the most massive part of the brain and consists of the diencephalon and cerebral hemispheres.
  - a. cerebrum
  - b. central nervous system
  - c. peripheral nervous system
  - d. thalamus

ANS: A

The cerebrum is the most massive part of the brain and consists of the diencephalon and cerebral hemispheres.

6. Which of the following vertical systems provides bidirectional communication between the brain and the smooth muscle, cardiac muscle, and glands?
  - a. Autonomic
  - b. Somatosensory
  - c. Motor
  - d. All of the options

ANS: A

The autonomic, somatosensory, and motor systems are the three vertical systems that have axons which extend through the periphery, spinal cord, and brain. The autonomic system provides bidirectional communication between the brain and the smooth muscle, cardiac muscle, and glands.

## Chapter 02: Neuroanatomy

### Lundy-Ekman: Neuroscience: Fundamentals for Rehabilitation, 6th Edition

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#### MULTIPLE CHOICE

1. The brainstem and cerebellum receive most of their blood supply from which of the following arterial branches?
  - a. Internal carotid and posterior cerebral

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- b. Vertebral and middle cerebral
- c. Vertebral and basilar
- d. Internal carotid and basilar

ANS: C

Branches of the vertebral and basilar arteries provide blood supply to the brainstem and cerebellum. These branches include the anterior and posterior spinal arteries (medulla), posterior cerebral arteries (midbrain), posterior inferior cerebellar arteries (medulla and cerebellum), and anterior inferior and superior cerebellar arteries (pons and cerebellum).

2. The middle cerebral arteries arise from the \_\_\_\_\_ and supply the \_\_\_\_\_.
- a. basilar artery; medial surfaces of the frontal and parietal lobes
  - b. internal carotid arteries; lateral cerebral hemispheres
  - c. anterior communicating artery; lateral cerebral hemispheres
  - d. internal carotid arteries; internal capsule, putamen, and caudate nucleus
  - e. internal carotid arteries; lateral cerebral hemispheres and internal capsule, putamen, and caudate nucleus

ANS: E

The middle cerebral arteries arise as branches from the internal carotid arteries and provide blood supply to a majority of the lateral cerebral hemispheres, as well as to the internal capsule, globus pallidus, putamen, and caudate nucleus.

3. Which of the following arteries are part of the circle of Willis?
- a. Internal carotid and vertebral arteries
  - b. Anterior and lateral cerebral arteries
  - c. Anterior and posterior cerebral arteries
  - d. Medial and lateral communicating arteries

ANS: C

The circle of Willis is a ring of nine anastomotic arteries: the left and right anterior cerebral arteries, the left and right internal carotid arteries, the left and right posterior cerebral arteries, posterior communicating arteries (left and right), and the anterior communicating artery. The basilar artery and middle cerebral arteries are sometimes also included in the circle.

4. The function of the meninges includes which one of the following?
- a. Regulation of extracellular fluid content
  - b. Protection of the brain and spinal cord
  - c. Circulation of cerebrospinal fluid
  - d. All of these options

ANS: D

The cerebrospinal fluid system consists of both the cerebrospinal fluid and the meninges. The meninges contain spaces called *dural sinuses*, which contribute to the return of blood and cerebrospinal fluid to the venous blood system. The meninges also provide buoyancy and protection to the brain and spinal cord, as well as regulate extracellular fluid content.

5. Which of the following correctly pairs a cerebral structure with its function?
- a. Corpus striatum; memory formation
  - b. Internal capsule; cortical and subcortical communication
  - c. Amygdala; somatosensory integration and processing
  - d. Epithalamus; regulation of metabolic rate

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ANS: B

Composed of the caudate nucleus and putamen, the corpus striatum is an important structure in the basal ganglia circuit, which is critical to the control of movement. The internal capsule consists of projections between the cerebral cortex and subcortical structures, thus facilitating communication between these areas. The amygdala plays an important role in emotion and some aspects of memory formation. The epithalamus consists primarily of the pineal gland and influences secretion of the endocrine glands.

6. The cerebral hemispheres are
  - a. divided by the central sulcus.
  - b. subdivided into four lobes per hemisphere.
  - c. composed primarily of gray matter, with an outer layer of white matter.
  - d. connected by the corpus callosum and anterior commissure.

ANS: D

The longitudinal fissure divides the two cerebral hemispheres, and each hemisphere can be subdivided into a total of six lobes: frontal, parietal, temporal, occipital, limbic, and insular. The surface of the cerebrum is composed of gray matter, with underlying white matter deep to this. The corpus callosum connects the majority of the left and right cerebral hemispheres, with the anterior commissure connecting the left and right temporal cortices.

7. Each cranial nerve
  - a. emerges from the spinal cord.
  - b. carries autonomic information
  - c. innervates the head, neck, and face.
  - d. carries motor or sensory information.

ANS: D

The cranial nerves are a series of 12 nerve pairs that emerge from the surface of the brain and are numbered according to their sites of attachment to the brain, from anterior to posterior. Cranial nerves I, II, and VIII carry only sensory information, whereas nerves III, IV, VI, X, and XII carry primarily motor information. The remaining cranial nerves (V, VII, IX, and XI) are mixed, carrying both motor and sensory signals. Although most cranial nerves innervate structures of the head, neck, and face, the vagus nerve (X) also innervates abdominal and thoracic structures. Cranial nerves III, VII, IX, and X also have autonomic functions.

8. Which one of the following functions is regulated by the structures of the diencephalon?
  - a. Processing of emotion and memory information
  - b. Integration of information for equilibrium
  - c. Coordination of movement
  - d. Orientation to visual and auditory stimuli

ANS: A

The diencephalon consists of the thalamus, hypothalamus, epithalamus, and subthalamus. These structures process emotion and some forms of memory. They also regulate consciousness and attention; maintain body temperature, metabolic rate, and chemical composition of the tissues; regulate eating, defensive, and reproductive behavior; and influence the secretion of endocrine glands.

9. A \_\_\_\_\_ plane divides a structure into anterior and posterior portions.
  - a. sagittal
  - b. horizontal

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- c. coronal
- d. parasagittal
- e. None of these options

ANS: C

A sagittal plane divides a structure into right and left portions. A midsagittal plane divides a structure into right and left halves and a parallel cut produces parasagittal sections. A horizontal plane cuts across a structure at right angles to the long axis of the structure. A coronal plane divides a structure into anterior and posterior portions.

10. \_\_\_\_\_ axons carry information from peripheral receptors toward the central nervous system; \_\_\_\_\_ axons carry information away from the central nervous system.
- a. Afferent; efferent
  - b. Efferent; afferent
  - c. White matter; gray matter
  - d. Gray matter; white matter

ANS: A

Afferent axons carry information from peripheral receptors toward the central nervous system. Efferent axons carry information away from the central nervous system. White matter axons convey information among parts of the nervous system. Information is integrated in the gray matter.

11. Which of the following is true about the internal capsule?
- a. The thalamus and basal ganglia are separated by the internal capsule.
  - b. The internal capsule is divided into anterior and posterior limbs, with a genu between them.
  - c. The internal capsule is composed of a collection of axons that run between the cerebral cortex and subcortical structures.
  - d. All of the options
  - e. None of the options

ANS: D

The internal capsule is bundle of axons which project in both directions between the cerebral cortex and subcortical structures. It is subdivided into anterior and posterior limbs, with the genu, or bend, in between. It separates the thalamus and basal ganglia.

## Chapter 03: Neurologic Disorders and the Neurologic Examination

### Lundy-Ekman: Neuroscience: Fundamentals for Rehabilitation, 6th Edition

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#### MULTIPLE CHOICE

1. A patient reports that she has recently had pain and a loss of coordination in her left leg. These symptoms initially began 5 days earlier, gradually worsened for 3 days, but then did not worsen or improve since that time. The speed of onset and nature of these complaints is most likely which one of the following?
- a. Acute vascular problem
  - b. Subacute degenerative disorder
  - c. Chronic inflammatory process
  - d. Subacute inflammatory process

ANS: D

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The speed of onset of a neurologic complaint can be classified as acute, subacute, or chronic. Acute problems achieve maximal signs and symptoms in minutes to hours and often indicate a vascular problem, whereas subacute problems arise over several days and may indicate an inflammatory process. Chronic problems gradually worsen over a period weeks, months, or years and may suggest either a tumor or degenerative disorder.

2. A patient visits the emergency department after a motor vehicle accident. He has suffered multiple blunt force head traumas. This patient's injury would be described as
  - a. focal.
  - b. multifocal.
  - c. diffuse.
  - d. Both multifocal and diffuse

ANS: B

Damage or injuries to the central nervous system are categorized as being focal, multifocal, or diffuse lesions. Focal lesions are limited to a single location, multifocal lesions are limited to several nonsymmetric locations, and diffuse lesions affect bilateral structures symmetrically but do not cross the midline as a single lesion.

3. The incidence of a disease is
  - a. the proportion of the population that develops a new case of the disorder in a defined period.
  - b. the current proportion of the population with the condition.
  - c. the cumulative sum of past years' prevalence rates.
  - d. typically reported as being per 1000 people.

ANS: A

The incidence of a disease refers to the proportion of the population that develops a new case of the disorder in a defined period. The prevalence of a disease is the current proportion of the population with the condition, including both old and new cases. Thus the prevalence of a disease is the cumulative sum of past years' incidence rates. Disease incidence is typically reported as per 100,000 people, whereas prevalence is typically reported per 1000 people.

4. A client rates his pain at 5/10 on Monday, 2/10 on Wednesday, and 1/10 on Friday. This individual's pain symptoms would best be described as:
  - a. stable
  - b. worsening
  - c. improving
  - d. fluctuating

ANS: C

This individual's pain symptoms would best be described as improving because pain continually decreased over the course of the week. Symptoms classified as worsening would show continuous negative change, while symptoms classified as stable would show no change. Fluctuating symptoms would exhibit both increases and decreases over the course of a defined time period.

5. Which of the following would be considered a symptom?
  - a. erythema
  - b. respiratory rate of 8 breaths per minute
  - c. nausea
  - d. paralysis

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ANS: C

Signs are evidence of a disease or an impairment that can be observed by someone other than the patient, while symptoms are a subjective experience of a patient. Erythema, respiratory rate, and paralysis can all be objectively measured or classified, while nausea must be reported by the patient.

## Chapter 04: Neuroimaging and Neuroanatomy Atlas

### Lundy-Ekman: Neuroscience: Fundamentals for Rehabilitation, 6th Edition

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#### MULTIPLE CHOICE

1. An individual is admitted to the hospital to investigate a recently discovered cerebral mass. To determine the metabolic rate of the mass, an imaging study is ordered, during which a radioisotope is injected into the patient's bloodstream. This study is an example of which one of the following?
  - a. Computed tomographic (CT) scan
  - b. Functional magnetic resonance image (fMRI)
  - c. Diffusion tensor image (DTI)
  - d. Positron emission tomography (PET) scan

ANS: D

A PET scan is a nuclear imaging study in which emissions from a radioactive compound are examined to assess blood flow, oxygenation, glucose metabolism, and/or receptor location. Techniques such as CT, DTI, and fMRI rely on the use of x-ray images, radio waves, or magnetic fields.

2. You are looking at a CT image of the human body. The less dense structures, including \_\_\_\_\_ appear \_\_\_\_\_ in color.
  - a. metal and bone; white
  - b. brain tissue; black
  - c. bone; light gray
  - d. air and cerebrospinal fluid; black

ANS: D

Material with increased density, including metal and bone, appears white on CT images. Less dense structures, including air and cerebrospinal fluid, appear black. Tissue with a high water content appears dark gray, and substances with a high protein concentration will be lighter gray. Brain tissue is light gray.

3. Magnetic resonance imaging (MRI) is the neuroimaging technique of choice in which of the following situations?
  - a. When studying soft tissue disease
  - b. In the evaluation of bone or an acute hemorrhage
  - c. When the patient has a pacemaker or cochlear implants
  - d. When studying soft tissue disease and in the evaluation of bone or an acute hemorrhage
  - e. When studying soft tissue disease and in the evaluation of bone or an acute hemorrhage, and when studying soft tissue disease and in the evaluation of bone or an acute hemorrhage

ANS: A

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MRI is the study of choice when looking at soft tissue disease and evaluating lesions of the pituitary gland. CT is better than MRI at evaluating bone and acute hemorrhage. MRI is contraindicated in those with metal fragments in the body, a pacemaker, or cochlear implants.

4. When evaluating a patient with multiple sclerosis, which imaging method is preferred for looking at plaques located near the ventricles?
- T1-weighted MRI
  - Fluid-attenuated inversion recovery (FLAIR) MRI
  - PET
  - Computed tomography (CT)
  - None of these options

ANS: B

FLAIR images are a type of T2 image in which the CSF and vitreous fluid signal are suppressed. This makes these images particularly useful when looking for plaques associated with multiple sclerosis that are near ventricles.

5. When comparing PET and fMRI, which is used more often and why?
- PET because fMRI cannot measure blood flow and oxygen metabolism
  - fMRI because it does not require radioactive isotope injection
  - fMRI because MRI scanners are more common than PET scanners
  - fMRI because it does not require radioactive isotope injection and fMRI because MRI scanners are more common than PET scanners
  - All of the options

ANS: D

Both fMRI and PET scans measure blood flow and oxygen metabolism. fMRI is used more frequently due to the fact that it does not require the injection of radioactive isotope, thus making it safer and noninvasive. In addition, PET scanners are not as common as MRI scanners that are used for fMRI.

6. CT angiography (CTA) is helpful in screening for all of the following except:
- Carotid stenosis
  - Arteriovenous fistula
  - Acute cerebral sinus thrombosis
  - Aneurysm

ANS: C

CTA, along with MR angiography (MRA), can be used to screen for carotid stenosis, aneurysm, and arteriovenous fistula or malformation. CT venography and MR venography are used in determining the presence of an acute cerebral sinus thrombosis.

7. You are looking at a coronal image of an MRI of the brain. This image can be oriented as though you are
- standing at the feet and looking toward the head of an inclined person.
  - standing in front of the person, looking at him or her.
  - standing to the side of the person, looking at his or her profile.
  - None of these options

ANS: B

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Coronal images are viewed as if you are standing in front of the person looking at him or her. Axial images are oriented as if you are standing at the feet and looking toward the head of an inclined person. Sagittal images are oriented as if you are standing to the side of a person and looking at them in profile.

8. Computed tomography should be avoided in which of the following?
- Emergent situations
  - When acute hemorrhage is suspected
  - In pregnant women and children
  - When metal devices are implanted in the body

ANS: C

Radiation is the main concern with CT and should be avoided in children and pregnant women. CT is the method of choice in emergent situations, including when identifying acute intracranial hemorrhage. The presence of implanted metal devices is a contraindication for MRI, not CT.

9. All of the following statements about DTI are true except:
- DTI is a type of MRI.
  - DTI highlights areas of reduced water movement.
  - DTI is used to create an image of the white matter tracts.
  - DTI has been used to document changes in the corticospinal tract after constraint-induced movement therapy.

ANS: B

Diffusion-weighted imaging (not DTI) is used to highlight areas of reduced water movement.

10. Your new patient has recently been diagnosed with an aneurysm, which was diagnosed via catheter angiography. This imaging method was likely used because
- it is safer than CT angiography (CTA) and MR angiography (MRA)
  - catheter angiography is a first-line modality.
  - there was high suspicion for a vascular lesion and the CTA came back normal.
  - it is the study of choice in emergent neurovascular conditions.

ANS: C

Catheter angiography is rarely used as a first-line modality, due to the increased risk for thrombosis and embolization and the high sensitivity of CTA and MRA. Catheter angiography may be necessary if the suspicion for a vascular lesion is high despite normal CTA or MRA results. CTA is the study of choice for emergent neurovascular conditions.

## **Chapter 05: Physical and Electrical Properties of Cells in the Nervous System** **Lundy-Ekman: Neuroscience: Fundamentals for Rehabilitation, 6th Edition**

### **MULTIPLE CHOICE**

1. Which one of the following neuron structures is specialized for receiving synaptic input from other neurons?
- Cell body
  - Dendrite
  - Axon
  - Axon hillock
  - Presynaptic terminal

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ANS: B

Dendrites, with branch-like extensions that serve as the main input sites for the cell and project from the soma, are specialized to receive information from other cells.

2. Which of the following is the structural part of a neuron that releases a neurotransmitter?
  - a. Dendrite
  - b. Axon hillock
  - c. Soma
  - d. Presynaptic terminal
  - e. Postsynaptic terminal

ANS: D

Axons end in presynaptic terminals, or finger-like projections, which are the transmitting elements of the neuron. Neurons transmit information about their activity via the release of chemicals called *neurotransmitters* from the presynaptic terminal into the synaptic cleft.

3. Pseudounipolar cells
  - a. have two dendrites.
  - b. have two somas.
  - c. are not neurons.
  - d. are glial cells.
  - e. have two axon extensions.

ANS: E

Pseudounipolar cells, a subclass of bipolar cells, appear to have a single projection from the cell body that divides into two axonal roots. Pseudounipolar cells have two axons and no true dendrites.

4. Retrograde transport
  - a. recycles substances from the axon back to the soma.
  - b. moves neurotransmitters from the dendrites to the cell body.
  - c. moves substances from the soma toward the axon terminal.
  - d. moves neurotransmitters across the synaptic cleft.
  - e. moves information from astrocyte to astrocyte.

ANS: A

Axoplasmic transport occurs in two directions: anterograde and retrograde. Anterograde transport moves neurotransmitters and other substances from the soma down the axon toward the presynaptic terminal. Retrograde transport moves substances from the synapse back to the soma.

5. Afferent neurons convey information
  - a. between interneurons.
  - b. from the CNS to skeletal muscles.
  - c. from peripheral receptors to the CNS.
  - d. between the soma and presynaptic terminal.
  - e. from the CNS to smooth muscles.

ANS: C