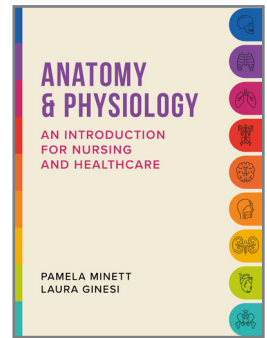




Lantern



Questions to accompany *Anatomy and Physiology*

CHAPTER 9 THE NERVOUS SYSTEM

Multiple Choice Questions (MCQs)

Each question consists of a stem statement or question, and 5 options. You must pick the one correct answer.

- The two main divisions of the central nervous system are:**
 - nerves and neurons
 - cerebral cortex and cerebrospinal fluid
 - brain and spinal cord
 - spinal cord and nerves
 - cerebral cortex and brainstem
- Which of the following divisions is NOT a part of the peripheral nervous system?**
 - brainstem
 - sympathetic
 - parasympathetic
 - sensory
 - enteric
- The cells within the nervous system that transmit action potentials are:**
 - axons
 - glial cells
 - dendrites
 - neurons
 - astrocytes
- The enteric nervous system is a network of neurons that function to:**
 - control GI motility and secretions
 - regulate reproductive function in men and women
 - control micturition – the elimination of urine
 - adjust the heart rate and cardiac output to match the body's needs
 - control voluntary movements
- The thin, branched processes of a neuron, whose main function is to receive incoming signals, are called:**
 - terminals
 - cell bodies
 - axons
 - dendrites
 - synapses
- Any drug that can act on the central nervous system must first pass through the blood–brain barrier, which:**
 - is the tough, outer sac that encloses the brain, spinal cord and cerebrospinal fluid
 - allows toxic substances and pathogens to reach brain tissue
 - maintains a uniform pressure within the cranium
 - is responsible for consciousness and cognitive functions
 - separates blood from cerebrospinal fluid
- How many lobes are in each cerebral hemisphere?**
 - two
 - three
 - four
 - five
 - seven
- How many pairs of cranial nerves originate within the brain?**
 - two
 - four
 - eight
 - twelve
 - sixteen

9. Impulses (action potentials) pass from one neuron to another at a microscopic gap, called a synapse, where they trigger release of chemical signal molecules, called:

- A. neurotransmitters
- B. hormones
- C. prostaglandins
- D. second messengers
- E. cytokines

10. Which of the following chemical substances is NOT an example of a neurotransmitter?

- A. acetylcholine
- B. glucose
- C. dopamine
- D. noradrenaline
- E. serotonin

11. The function of the myelin sheath found on myelinated neurons is to:

- A. nourish them
- B. insulate them
- C. protect them
- D. support them
- E. destroy them

12. A reflex action is a pathway that typically involves several neurons and mediates:

- A. an action that has to be learned
- B. an action that involves conscious thought
- C. an action that is repeated
- D. an involuntary response to a stimulus
- E. an intention to make a voluntary movement

Critical thinking: ARQs (assertion reasoning questions)

These questions consist of two statements:

- an assertion, and
- a reason.

You must first determine whether each statement is *TRUE* or *FALSE*.

- If both statements are true, you must next determine whether the reason correctly explains the assertion. The answer will be option 1 or option 2.
- If one statement is true and the other is false then the answer is option 3 or option 4, depending on which of the statements is correct.
- If both statements are false, then the answer is option 5.

There is one option for each possible outcome.

Question 13

A = the Assertion	R = the Reason
Nerves that regulate cardiac muscle, urinary bladder and glands belong to the sensory nervous system	The brain and spinal cord are protected by skin, bone, meninges and synovial fluid
Options	
1. Both A and R are true and R is the correct explanation of A	
2. Both A and R are true but R is NOT the explanation of A	
3. A is true but R is false	
4. A is false but R is true	
5. Both A and R are false	

Question 14

A = the Assertion	R = the Reason
Synapses form the functional junctions that enable communication between two adjacent neurons	When an impulse arrives at the terminal of a presynaptic neuron, it stimulates the release of neurotransmitter molecules, which cross the gap and bring about a response in the neighbouring cells
Options	
1. Both A and R are true and R is the correct explanation of A	
2. Both A and R are true but R is NOT the explanation of A	
3. A is true but R is false	
4. A is false but R is true	
5. Both A and R are false	

Question 15

A = the Assertion	R = the Reason
The cerebrum, composed of two cerebral hemispheres, is responsible for control of voluntary movement, sensation and perception, and voluntary movement	There is no transmission of information between the two cerebral hemispheres, which are separated by a deep central fissure and the corpus callosum
Options	
1. Both A and R are true and R is the correct explanation of A	
2. Both A and R are true but R is NOT the explanation of A	
3. A is true but R is false	
4. A is false but R is true	
5. Both A and R are false	

Question 16

A = the Assertion	R = the Reason
Depolarisation of a neuron arises because of opening of K ⁺ channels, which briefly reverses the membrane potential	The resting potential of the neuron cell membrane is maintained by means of an electrochemical gradient, so the cytoplasm is negatively charged compared to the exterior
Options	
1. Both A and R are true and R is the correct explanation of A	
2. Both A and R are true but R is NOT the explanation of A	
3. A is true but R is false	
4. A is false but R is true	
5. Both A and R are false	

Question 17

Match the terms in the list with the correct description (A-F) of function, in terms of transmission of nerve impulses:

Axon	
Dendrite	
Afferent	
Efferent	
Grey matter	
White matter	

- A. Part of a neuron, which receives incoming stimuli
- B. Nerve that transmits impulses from sense organs towards the central nervous system (CNS)
- C. Consists mainly of neuron cell bodies
- D. Consists mainly of neuron cell fibres
- E. Part of a neuron that conducts impulses away from the cell body
- F. Part of a neuron that directs impulses away from the CNS towards a muscle or gland

Question 18

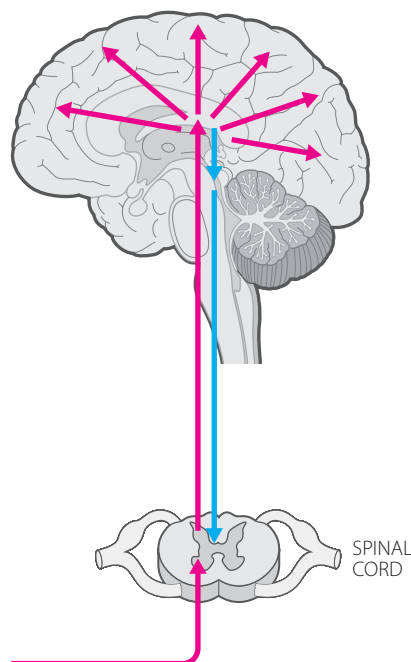
Complete the table by matching the event from the list to the description in the table.

Na ⁺ channels closed and K ⁺ channels opened so that K ⁺ ions can exit the cell	
The cell is expending energy to maintain a membrane potential of -70mV	
There is a certain amount of overshoot so that the neuron membrane is more negative than at rest	
The plasma membrane is not responsive to stimuli until after the resting potential has been restored	
There is a sudden surge of entry of sodium ions (Na ⁺) because Na ⁺ channels have opened	

- A. Resting potential
- B. Depolarisation
- C. Repolarisation
- D. Hyperpolarisation
- E. Refractory

Question 19

Label the diagram of the pain pathway (below) to show the route taken by impulses when sensory endings are stimulated and the brain perceives pain. Write short notes about each stage of the process.



Question 20

Complete the two lists in the table below to show the different activities and functions of the sympathetic and parasympathetic divisions of the autonomic nervous systems on some key organs of the human body.

Sympathetic nervous system	Organ	Parasympathetic nervous system
	Eye muscles	
	Salivary glands	
	Heart	
	Respiratory system	
	Stomach	
	Intestines	
	Pancreas	
	Gall bladder	
	Urinary bladder	

Answers to questions

Answers are supplied to most, but not all questions. Some may require you to carry out further research using the book.

Multiple Choice Questions (MCQs)

Each question consists of a stem statement or question, and 5 options. You must pick the one correct answer.

- The two main divisions of the central nervous system are:**
C. brain and spinal cord
- Which of the following divisions is NOT a part of the peripheral nervous system?**
A. brainstem
- The cells within the nervous system that transmit action potentials are:**
D. neurons
- The enteric nervous system is a network of neurons that function to:**
A. control GI motility and secretions
- The thin, branched processes of a neuron, whose main function is to receive incoming signals, are called:**
D. dendrites
- Any drug that can act on the central nervous system must first pass through the blood-brain barrier, which:**
E. separates blood from cerebrospinal fluid
- How many lobes are in each cerebral hemisphere?**
C. four
- How many pairs of cranial nerves originate within the brain?**
D. twelve
- Impulses (action potentials) pass from one neuron to another at a microscopic gap, called a synapse, where they trigger release of chemical signal molecules, called:**
A. neurotransmitters
- Which of the following chemical substances is NOT an example of a neurotransmitter?**
B. glucose
- The function of the myelin sheath found on myelinated neurons is to:**
B. insulate them
- A reflex action is a pathway that typically involves several neurons and mediates:**
D. an involuntary response to a stimulus

Critical thinking: ARQs (assertion reasoning questions)

These questions consist of two statements:

- an assertion, and
- a reason.

You must first determine whether each statement is *TRUE* or *FALSE*.

- If both statements are true, you must next determine whether the reason correctly explains the assertion. The answer will be option 1 or option 2.
- If one statement is true and the other is false then the answer is option 3 or option 4, depending on which of the statements is correct.
- If both statements are false, then the answer is option 5.

There is one option for each possible outcome.

Question 13

A = the Assertion	R = the Reason
Nerves that regulate cardiac muscle, urinary bladder and glands belong to the sensory nervous system	The brain and spinal cord are protected by skin, bone, meninges and synovial fluid
5. Both A and R are false	
<p><i>Explanation</i></p> <p>The Assertion (A) is <i>FALSE</i>. The statement refers to the autonomic nervous system, which innervates (supplies) visceral organs of the body which is part of the motor division.</p> <p>The Reason (R) statement is <i>FALSE</i>. The central nervous system is bathed in cerebrospinal fluid (CSF) which circulates from the choroid plexus and the ventricular system before being reabsorbed by the arachnoid granulations.</p> <p>The two statements are incorrect so option 5 is the correct choice.</p>	

Question 14

A = the Assertion	R = the Reason
Synapses form the functional junctions that enable communication between two adjacent neurons	When an impulse arrives at the terminal of a presynaptic neuron, it stimulates the release of neurotransmitter molecules, which cross the gap and bring about a response in the neighbouring cells
1. Both A and R are true and R is the correct explanation of A	
<p><i>Explanation</i></p> <p>The Assertion (A) is <i>TRUE</i>. A synapse is the microscopic space between two neurons (or a neuron and its effector organ). Synapses are capable of storing neurotransmitter molecules and releasing them following stimulation. In most synapses of the peripheral nervous system, the neurotransmitter release from the terminal is acetylcholine; in the sympathetic division of the autonomic system, it is noradrenaline.</p> <p>The Reason (R) is <i>TRUE</i>. The function of a synapse is to enable communication between neighbouring neurons and this is achieved through the action of the released neurotransmitter molecules. They bind to specific receptors on the postsynaptic membrane and bring about a specific response, e.g. depolarisation.</p> <p>The two statements are true and the Reason (R) provides an explanation for the functional connection between neurons.</p> <p>Therefore option 1 is the correct answer.</p>	

Question 15

A = the Assertion	R = the Reason
The cerebrum, composed of two cerebral hemispheres, is responsible for control of voluntary movement, sensation and perception, and voluntary movement	There is no transmission of information between the two cerebral hemispheres, which are separated by a deep central fissure and the corpus callosum
3. A is true but R is false	
<p><i>Explanation</i></p> <p>The assertion (A) is <i>TRUE</i>. The statement refers to some of the key functions of the cerebrum (or forebrain), which comprises two highly folded cerebral hemispheres, the basal ganglia and the corpus callosum. The cerebrum is the centre for thinking and learning processes, language, control of movement and consciousness including memory, personality and sensory perception.</p> <p>The Reason (R) is <i>FALSE</i>. Although the cerebrum is composed of two hemispheres that are separated by a deep fold called the central fissure, the corpus callosum (meaning 'tough body') is a C-shaped band of white matter (myelinated axon fibres) that acts as a connector and allows communication between the two.</p> <p>Option 3 is therefore the right answer.</p>	

Question 16

A = the Assertion	R = the Reason
Depolarisation of a neuron arises because of opening of K ⁺ channels, which briefly reverses the membrane potential	The resting potential of the neuron cell membrane is maintained by means of an electrochemical gradient, so the cytoplasm is negatively charged compared to the exterior
4. A is false but R is true	
<p><i>Explanation</i></p> <p>The Assertion (A) is <i>FALSE</i>. K⁺ is the chemical symbol for potassium ions. Depolarisation is triggered when a neuron stimulated with a supra-threshold stimulus opens sodium (Na⁺) channels in the membrane, allowing sodium ions to enter the cell, which reverses the resting potential.</p> <p>The Reason (R) is <i>TRUE</i>. Several important processes contribute to the resting membrane potential of any cell, which means the interior is negatively charged compared to the exterior. Permeability of the plasma membrane to sodium ions (Na⁺) and potassium ions (K⁺) is different, and active transport ion exchange 'pumps' (Na⁺/K⁺ ATPase) use metabolic energy to make the electrochemical environments of the interior of the cell and the extracellular fluid around it quite different.</p> <p>The correct answer for this problem is thus option 4.</p>	

Question 17

Match the terms in the list with the correct description (A–F) of function, in terms of transmission of nerve impulses:

Axon	F
Dendrite	A
Afferent	B
Efferent	E
Grey matter	C
White matter	D

- A. Part of a neuron, which receives incoming stimuli
- B. Nerve that transmits impulses from sense organs towards the central nervous system (CNS)
- C. Consists mainly of neuron cell bodies
- D. Consists mainly of neuron cell fibres
- E. Part of a neuron that conducts impulses away from the cell body
- F. Part of a neuron that directs impulses away from the CNS towards a muscle or gland

Question 18

Complete the table by matching the event from the list to the description in the table.

- A. Resting potential
- B. Depolarisation
- C. Repolarisation
- D. Hyperpolarisation
- E. Refractory

Na ⁺ channels closed and K ⁺ channels opened so that K ⁺ ions can exit the cell	C
The cell is expending energy to maintain a membrane potential of –70mV	A
There is a certain amount of overshoot so that the neuron membrane is more negative than at rest	D
The plasma membrane is not responsive to stimuli until after the resting potential has been restored	E
There is a sudden surge of entry of sodium ions (Na ⁺) because Na ⁺ channels have opened	B