UNIVERSITY OF JOHANNESBURG

LIFE SCIENCES FET 3B FOR TEACHERS

CLASS TEST 1: THE CENTRAL NERVOUS SYSTEM

DATE: 10 August 2020 MODULE CODE: LSFT03B

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QUESTION 1 (8)

Various options are provided as possible answers to the following questions. Select and write down the letter of the option that best answers / completes the question.

1.1 Our emotions, memory and learning depend on the:

A. Limbic system
B. Parietal lobes
C. Frontal lobes
D. All the above
E. Both B and C

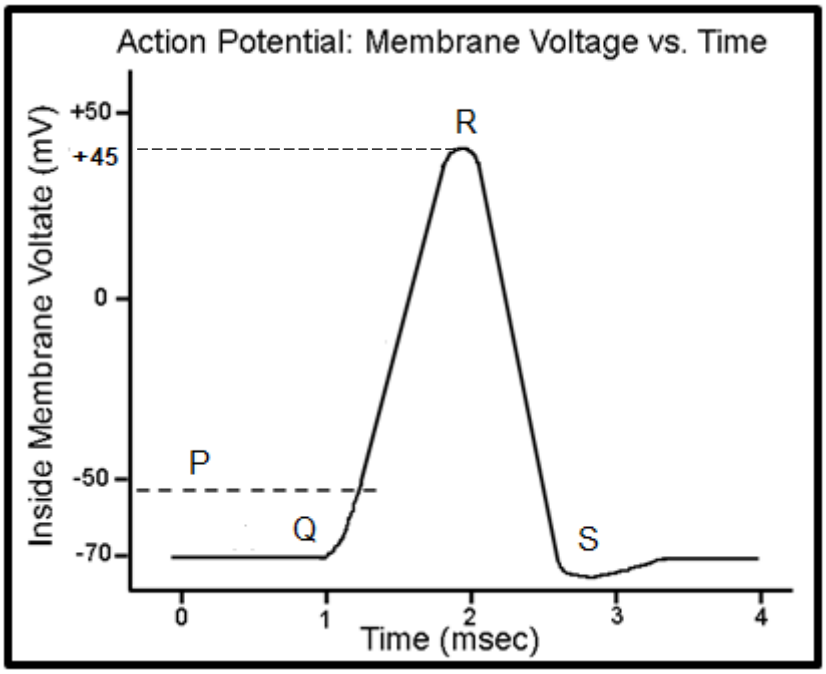
1.2 Which of the following statements regarding the brain is true?

A. Ventricles in the brain are filled with interstitial fluid
B. The blood-brain barrier maintains a stable chemical environment for the brain
C. Layers of connective tissue surround and protect the brain and spinal cord
D. White matter is mainly dendrites

1.3 Which statement about Parkinson's disease is true?

A. Parkinson's disease can be cured with injections of serotonin
B. Parkinson's disease results from the death of neurons in the cerebellum
C. Parkinson's disease is a motor disorder, affecting movements of the body
D. Parkinson's disease is age-related, decreasing in frequency as people age

Question 1.4 to 1.5 relate to the graph shown below. The graph shows the membrane potential (in mV) as a function of time, along a neural process.



1.4 During which phase is the condition below true?

_ _ _ _ _ _ _ _ _ + _ Outside the process

+ + + + _ _ + + + + + + Inside the process

_ _ _ + _ _ _ _ _ _ _ _ Outside the process

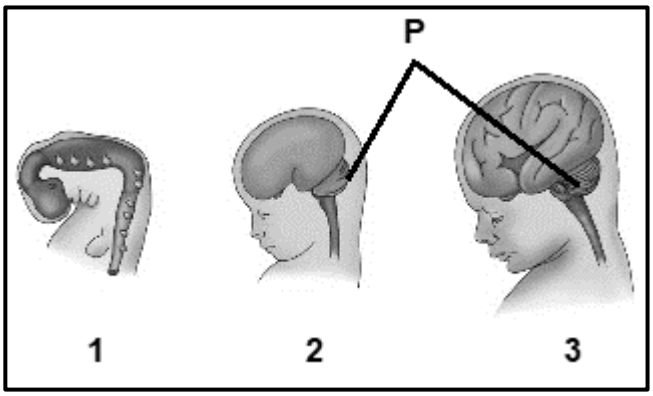
KEY:
+ : Sodium ion
- : Potassium ion

A. At P
B. From R to S
C. From Q to R
D. At R
E. From Q to S

1.5 What is the minimum change in polarity across the membrane of this process required to generate an action potential?

A. – 70 mV
B. – 52 mV
C. 45 mV
D. 50 mV

1.6 The diagram below shows the brain development of a foetus.



What bodily function(s) is primarily fulfilled by brain structure P during gestation?

A. Maintaining posture and balance
B. Co-ordinating body movements
C. Controlling of body movement
D. Both B and C
E. None of the above

1.7 The brain and sensory system of a bilaterally symmetric organism functions like:

A. The engine of a motorboat
B. The pilot of an airplane
C. The passengers on a train
D. A member of a marching band

1.8 Which of the following represent a reflex arc?

A. Receptor → spinal cord → effector
B. Effector → spinal cord → receptor
C. Receptor → spinal cord → brain
D. Muscle → spinal cord → brain

QUESTION 2 **(7)**

Using your own words, write down the biological definitions for the following terms:

2.1 Ganglia

2.2 Reflex arc

2.3 Conus medullaris

2.4 Cranial nerves

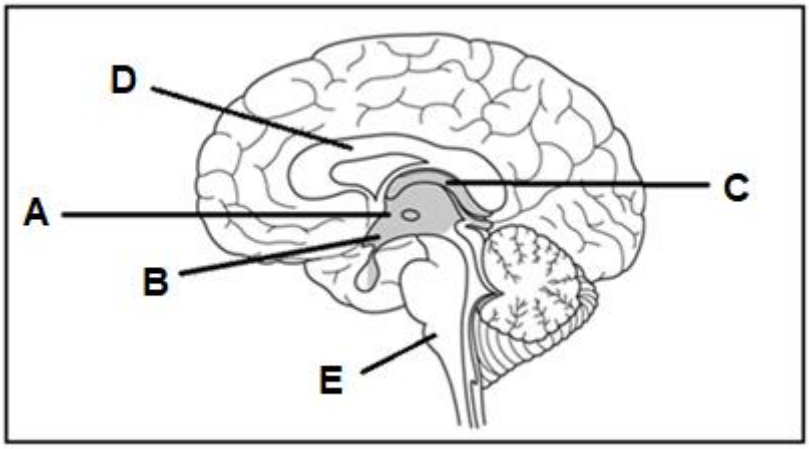
2.5 Cephalisation

2.6 Neurotransmitters

2.7 Bipolar disorder

QUESTION 3 **(19)**

Study the diagram below and answer the questions that follow.



A sectional diagram through the human brain.

3.1.1 What is the collective name given to A, B and C? (1)

3.1.2 Respectively discuss the body functions controlled by A, B and C. Provide the biological name of each in your answer. (9)

3.2 Name D and state the region of the brain in which D is located. (2)

3.3 An individual experiences a stroke in their **hindbrain**.

3.3.1 Provide the letter and name of the structure in the diagram which is found in the hindbrain. (2)

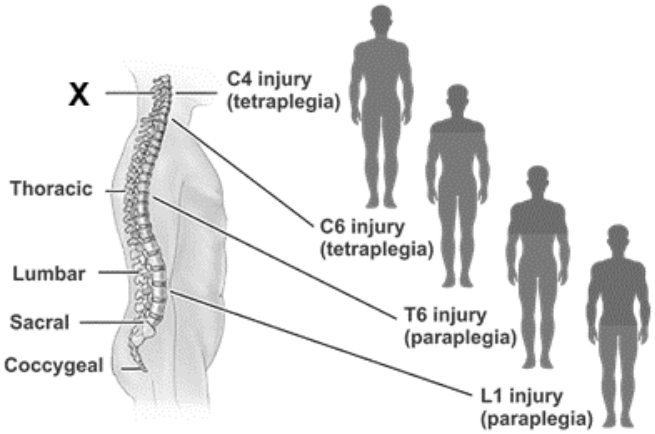
3.3.2 List any five (5) body process that are directly impacted by this stroke. (5)

QUESTION 4 **(15)**

Study the information below and answer the questions that follow.

SPINAL CORD INJURIES

A spinal cord injury disrupts signals, and usually occur because of a blow that fractures or dislocates your vertebrae, the bony disks that make up your spine. Some injuries do not cut through the spinal cord. Instead, they cause damage when pieces of vertebrae tear into cord tissue or press down upon the **nerve parts** that carry signals. The image below shows the extent of paralysis caused by injury to the spinal cord at different sections of the vertebral column.



4.1 Name the region of the vertebral column represented by X. (1)

4.2 Differentiate between *paraplegia* and *tetraplegia*, using the image. (2)

4.3 Other than the vertebral column, list two (2) ways in which the spinal cord is physiologically protected. (2)

4.4.1 Name the two **nerve parts** that carry signals and state the direction (relative to a neuron cell body) of the signal for these nerve parts. (4)

4.4.2 Explain how the **nerve parts** are arranged in grey and white matter. (2)

4.5 Explain how the spinal cord functions with the:

4.5.1 Autonomic nervous system (2)

4.5.2 Somatic nervous system (2)

QUESTION 5 **(11)**

Memory formation depends on strengthening synapses in the brain.

5.1	Define the term *synapse.*	(3)
5.2	What type of activity (chemical or electrical) occurs across a synapse?	(1)
5.3	During memory formation, discuss the role of the following:	
5.3.1	Calcium ion gates	(3)
5.3.2	Post-synaptic membrane	(2)
5.4	List two poor lifestyle habits that can affect memory formation.	(2)

TOTAL: 60