

Section 11.2: Review Answers

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1. Scientists estimate that there are more neurons in the human brain than stars in the Milky Way Galaxy. The brain therefore requires a constant supply of nutrients and oxygen to feed these cells. In fact, the brain, which comprises only 2% of the body's total weight, uses at least 20% of the body's oxygen and energy supplies. If the oxygen supply to the brain is disrupted for even a few minutes, massive damage can occur in the brain. One function that requires nutrients and oxygen is the transmission of nerve impulses, which requires ATP in order to establish the resting membrane potential (see Section 11.1 of the student textbook). Cellular respiration is the process that produces ATP for all cells—including the neurons. Cellular respiration requires a continual supply of nutrients (glucose) and oxygen. Therefore, in order to continually supply brain cells with ATP, the brain must have a continual supply of oxygen and glucose.
2. The 3 structures that support and protect the central nervous system are
 - bone—the vertebral column protects the spinal cord; the skull protects the brain
 - meninges—these layers of tough, elastic tissues are found in both the spinal cord and brain. The meninges protect the central nervous system by preventing the direct circulation of blood through the cells of the brain and spinal cord.
 - cerebrospinal fluid—the fluid circulates throughout the spaces within the brain and spinal cord. It acts as a shock absorber to cushion the brain.
3. Bacterial meningitis is a potentially fatal disease. A doctor will perform a spinal tap if he/she suspects meningitis. A spinal tap allows the doctor to withdraw a small amount of the cerebrospinal fluid and send it to a lab for testing. Bacterial cultures of the cerebrospinal fluid can be used to diagnose this disease.

4.

Label	Structure	Functional Problems
A	primary motor area of the frontal lobe	Damage to this area could result in loss of motor function.
B	thalamus	Damage to this area could result in impaired vision, hearing, and senses such as touch.
C	cerebellum	Damage to this area could result in loss of balance or lack of muscle coordination.
D	medulla oblongata	Damage to this area could result in the body's inability to regulate heart rate, blood pressure, breathing, swallowing, and vomiting
E	corpus callosum	Damage to this area could result in loss of communication between the two hemispheres of the cerebral cortex.
F	hypothalamus	Damage to this area can result in the inability to control homeostatic mechanisms including hormones, heart rate, blood pressure, body temperature, and drives such as hunger, thirst, and sexual desire.
G	pons	Damage to this area could result in a lack of communication between the right and left halves of the cerebrum, the cerebellum, and the rest of the brain.

5. (a) Seeing this question is the responsibility of the occipital lobes because they receive and analyze visual information.
- (b) Thinking about this question is the responsibility of the frontal lobes because they control reasoning and critical thinking.
- (c) Hearing the question read by someone else is the responsibility of the temporal lobes because their main function is auditory reception.
- (d) Reading this question to someone else is the responsibility of the frontal lobes, specifically Broca's area because it coordinates the muscles for speaking and translates thought into speech.
- (e) The parietal lobe of the cerebral cortex of a person using Braille would be stimulated. The parietal lobes receive and process sensory information from the skin. The proportion of a parietal lobe devoted to a particular part of the body is related to the

importance of sensory information for this part of the body.

6. The doctor would suspect that the stroke has damaged Wernicke's area of the temporal lobe and the primary motor area on the right side of the brain. The right side of the brain controls the left side of the body, so damage to the primary motor cortex on the right side of the brain will result in paralysis on the left side of the body. Wernicke's area stores the information involved in language comprehension. The ability to utter words is not affected if this area is damaged, but the words make little sense.
7. PET scans can detect active areas of the brain, so they can be used to diagnose conditions such as stroke or Alzheimer's disease, in which there is deterioration of the brain.
- MRI can produce very clear and detailed images of brain structure and can be used to identify various brain disorders, such as brain tumours.