**Assignment cover sheet: BIOL125 written assessment**

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Qno1  
i) According to the given symptoms and the result of angiography, which showed the vascular blockage in the basilar artery. Otto Brioche should be suffering from a condition known as basilar artery occlusion/ blockage.

ii) The most affected artery due to the condition is basilar artery. Basilar artery is one of the critical blood vessels in brainstem. The main function of the artery is to supply blood to the brainstem and cerebellum.

iii) The main critical areas that have been affected/ damaged by the blockage of basilar artery in the given scenario may include the areas supplied by the posterior circulation, which is located in brainstem and cerebellum. The brainstem areas are responsible for essential functionality in body like consciousness, heart rate and many others. The cerebellum is responsible for motor control and coordination. Similarly, due to blockage in basilar artery there can be problems in vision like blur vision, difficulty in looking at some colors and so on. The above symptoms of blockage in basilar artery matches with the given scenario of Otto Brioche so, there is high probability that Otto, has suffered from the above condition.

Qno 2  
  
According to the given MRI, Mark has complete sectioning of spinal cord at certain level, which means that bot ascending and descending tracts are damages at that certain level.

a) Feel sensation/perceive sensory stimuli from and move his arms: Yes, Mark should be able to feel the sensation and move his arms. In this case the spinal cord segments which are responsible for innervating the upper limbs are located below the injury level. The ascending and descending tracts are likely to be less damaged in this case. Hence, Mark should continue to have arm function and sensation.

b) Feel sensation/perceive sensory stimuli from and move his legs: No, Mark is should not be able to feel the sensation and move his legs. In this case the spinal cord segments which are responsible for innervating the lower limbs are located below the injury level. The ascending and descending tracts are likely to be damaged in this case. Hence, Mark likely loses the sensation in his legs below the injury level.

In conclusion the upper limbs should be able to feel the sensation whereas the lower limbs should most likely lose the sensation.

Qno3:  
We can determine the blood type of Mark with the help of given diagram. According to the given diagram, Its seen that Mark’s blood type is A positive. This can be determined by the presence if A antigens on the RBC (Red Blood Cells) and the absence of B antigens. Mark’s blood contains anti -B which likely attacks B antigens.

In the context of B- blood donor, their blood has B antigens and does not have A antigens. B- blood contains both anti-A and anti-B.

B- blood cannot be safely administered to Mark, as anti-B antibodies present in the blood of Mark will attack the B antigens present in the donor’s blood. Which may lead to dangerous immune response.

In summary, Mark’s blood contains A antigens in RBC and Anti -B antibodies in plasma. In donor’s blood there contains, B antigens on RBC and anti -A and anti-B antibodies in plasma.

Its very much important to check the compatibility of blood of donor with the blood of recipient to prevent dangerous immune response.   
  
  
Qno4  
Mark’s 85 years old grandmother burnt her hand because of holding the cup of coffee for too long. This major reason for her to hold the cup for long time might be age-related changes in both peripheral nervous system and central nervous system.

The peripheral nervous system’s neurons are responsible for identifying temperature changes, but due to old age the peripheral nervous system might not have been functioning properly which eventually led to taking more time to determine the heat and change in temperature.

Due to high age the interpretation and processing of sensory information in the central nervous system might have been affected. In the above context sue to high age the speed of transmission of signal between neurons might have been reduced which caused delay in determining the temperature change.

Qno5  
A. The phenomenon responsible for the increased blood flow through the isolated skeletal muscle is known as vasodilation.

When nerve stimulation causes a muscle to contract at high frequency the muscle needs to be more oxygenated, and nutrition should meet the higher metabolic needs. Vasodilation or elongation of blood vessels, which are caused by the relaxation of smooth muscle in the blood vessels, is triggered by the increased demand. Chemical components that accumulate together as a outcome of increased metabolism, such as carbon dioxide, lactic acid etc, cause the vasodilation or elongation of blood vessels. These elements induce hyperpolarization of the muscles cells, which eventually results in relaxation and subsequent vasodilation. As a result, the muscle experiences an increase in blood flow, which removes waste products from the metabolism and delivers more oxygen and minerals.

The skeletal muscle's enhanced activity in the preparation described has stimulated the vascular smooth muscle surrounding the muscle fibers, increasing the skeletal muscle's blood flow. Because of the relaxation of the vascular walls brought about by the increased contraction of the smooth muscle in the blood vessels, there is an increase in blood flow through the isolated skeletal muscle.

B. Condition 1: The tone popping effect will not occur if a significant amount of curare is added to the oxygenated saline used to perfuse the isolated muscle. The reason behind this is that curare is a particular nicotinic receptor blocker. The neuromuscular junction contains nicotinic receptors, and the neuromuscular junction's ability to function properly depends on the function of these receptors. The action potential travels from the nerve to the muscle via the neuromuscular junction, and it is the lack of this action potential that permits increased blood flow through the isolated skeletal muscle. The tone popping effect stops when curare blocks the nicotinic receptors, preventing the normal depolarization and consequent calcium ion influx.

Condition 2: The tone popping effect will be eliminated if tetrodotoxin is introduced in substantial quantities to the oxygenated saline that perfuses the isolated muscle. One powerful inhibitor of voltage-gated Na+ channels is tetrodotoxin. These Na+ channels are essential for muscle activation. The neuromuscular junction depolarizes as a result of the action potential that travels through the nerve axon. The muscle cell permits the entry of Na+ ions through the voltage-gated Na+ channels. The afterdepolarization caused by this Na+ ion inflow opens the voltage-gated Ca2+ channels in the muscle cell's sarcolemma. Muscle contraction is caused by an increased influx of calcium ions that enter the muscle cell through the Ca2+ channels.  
  
  
Qno6  
Otto's case illustrates how consuming a Red Bull led to a notable rise in his blood pressure. The autonomic nervous system (ANS), and more especially the baroreceptor reflex, is responsible for this. The body's instinctive reaction to a range of internal and external stimuli is controlled by the autonomic nervous system (ANS).

Otto consumed the Red Bull, which was strong in caffeine, a potent stimulant of the central nervous system (CNS). Otto's veins fills with Red Bull caffeine, which swiftly makes its way to his brain. Caffeine causes the CNS, particularly the cerebral cortex, to experience an increase in blood flow and activity.

The peripheral nervous system (PNS), which regulates the body's muscles and viscera, is thereafter in communication with the central nervous system (CNS). The vagus nerve, which innervates the baroreceptor reflex, is activated by the PNS in reaction to the CNS's heightened activity.

A homeostatic process called the baroreceptor reflex controls the frequency and pace of heartbeats, which in turn keeps blood pressure stable. It is brought on by variations in blood pressure, which can be brought on by a number of things, including physical activity, emotional states, and the use of certain medications like coffee. Both the parasympathetic and sympathetic nervous systems are involved in the reflex mechanism (PNS).

The baroreceptor reflex kicks in to raise blood pressure as a result of the caffeine in Red Bull. Heart rate rises as a result of the SNS stimulating the heart to contract more frequently and quickly. In addition, the PNS lowers blood pressure by blocking the release of adrenaline. The blood pressure can return to normal as a result of this balance between the SNS and PNS.

In Otto's case, the baroreceptor reflex mechanism causes his blood pressure to rise as a result of the caffeine in the Red Bull. The baroreceptor reflex is triggered by the ANS, which in turn triggers the SNS and suppresses the PNS. His blood pressure remains within the normal range because to this homeostatic mechanism.

After consuming the Red Bull, Otto's blood pressure is largely maintained by the ANS. Otto's blood pressure is kept steady and within normal range by the autonomic nervous system (ANS), which balances the sympathetic and parasympathetic neural systems.

Qno7  
A piece of the meniscus, a thin cartilage disk that serves as a shock absorber between the upper and lower halves of the knee joint, is represented by the structure highlighted by the red arrow in Figure 3. The preservation of the knee joint's integrity and the promotion of range of motion are two physiological roles of the organ system that this structure is a part of. Otto's meniscus may deteriorate in its capacity to perform these duties as he ages due to cartilage loss. Joint pain, reduced range of motion, and stiffness could arise from this. B. The skeletal muscle is the organ system seen in Figure 3. Together, the voluntary and involuntary muscles in this system enable movement, force production, and support the body. Skeletal muscle's anatomical and functional characteristics include the capacity to store and release energy in the form of ATP, the ability to shorten (contract) and lengthen (relax), and a mechanism for maintaining its resting length. C. The periosteum, a fibrous connective tissue, is the tissue denoted by the red arrow in Figure 3. This tissue covers the outer layer of bone and is located around the ends of long bones. Compared to a damaged bone, the periosteum takes longer to heal because of its remarkable capacity to accelerate healing through increased blood flow, inflammation, and tissue repair. There is a gap between the ends of the bones because the periosteum permits the soft tissues around it to enlarge. In order to fill the space, the swelling subsequently permits the repositioning of broken bone pieces and the formation of new bone. Because of the extra measures needed to promote healing, this healing process takes longer than fixing a shattered bone. D. The osteoblast, which is in charge of creating new bone tissue, is the primary cell in the tissue shown by the red arrow in Figure 3. The osteoblast produces new bone cells through a process known as osteogenesis and secretes minerals and proteins. Because osteoblasts are present in the periosteum and help to promote the creation of new bone tissue, this tissue heals more slowly than a damaged bone. Additionally, the management of bone metabolism and preservation of bone density are functions of the osteoblasts.