

1. Describe the basic parts and functions of the nervous system. Include in your description the following terms: central nervous system, peripheral nervous system, brain, spinal cord, sensory nerves, motor nerves, somatic, autonomic, parasympathetic, and sympathetic.

My answer: Central nervous system: brain and the spinal cord

Peripheral nervous system: nerves within the body that communicate with the central nervous system

Nerves: bundles of neurons

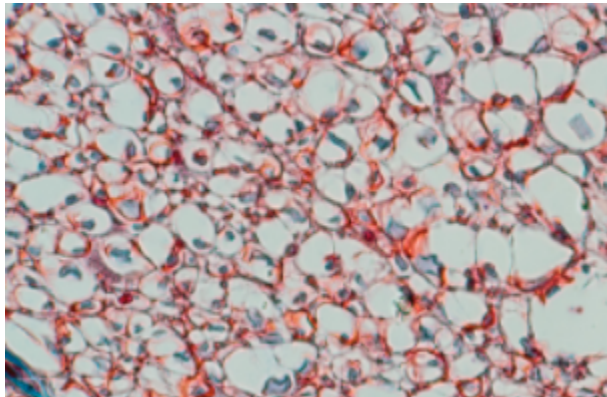
How information is processed: Receive information (sensory) -> process information (integration) -> response (motor).

Sensory nerves respond (motor) back based on processed information. There are two types of responses, somatic, voluntary, and autonomic, involuntary. A somatic response is like when something is done on purpose, like lifting one's arm. An autonomic response is something the body does without the person thinking about it, like sweating.

Nerves are bundles of neurons (nerve cells) that (1) receive sensory information, (2) send it to the central nervous system (brain and spinal cord) for processing, and then (3) respond in some motor fashion, like causing muscle to contract. The motor nerve response is voluntary and under our control is called somatic, the nerve response that is involuntary and out of our control is called autonomic.

The sympathetic and parasympathetic nervous systems go hand in hand. The parasympathetic nervous system is like the body's resting system because it helps the body relax by doing things like reducing heart rate. The sympathetic nervous system is the alert system of the body. It increases the body's heart rate, gives more blood to the muscles, and increases alertness.

2. The image below is a transverse (cross-sectional) cut through a nerve. Describe what each circle (with a "dot" inside) represents in this image, and why the clear material within the circles is important



My answer: Each dot is an axon with myelin around them. Myelin is fat around the axon that allows signals to travel through the axon faster.

3. Outline the basic steps of a reflex arc, including how a signal travels through the nervous system in a "knee jerk" response.  
My answer: A "knee jerk" response is an example of a reflex arc. The receptor is told a signal, like a hit from a small hammer, that sends the signal through the sensory neuron into the spinal cord. From there the cord sends a signal through the motor neuron to the effector of the muscle to cause a reaction to the impact on the receptor. The brain only plays a role after the reaction, though it is a split-second difference.  
Better answer: A reflex arc is a hardwired response to a stimulus. A signal is picked up from effector sensory neurons of the peripheral nervous system and sent to the central nervous system (spinal cord). The information is processed through a hardwired circuit and effector motor neurons of the peripheral nervous system are fired to cause muscles to contract. The information eventually is received by the brain, but the action has likely already taken place.
4. There are many things we still do not understand about the nervous system and brain function. Provide an example of two things we need to learn more about, explaining why this research is important, not just in terms of individual health, but also economically.  
My answer: Alzheimer's disease (AD): build-up of material in the brain that causes brain loss. Here, cells mistakenly build up plaque that causes memory loss. We can not diagnose AD properly until after the person has passed. Because we do not have a solution to AD yet, it is very expensive to treat the symptoms.

Pain: can't figure out how much pain a person goes through, not sure what causes pain, and no effective treatment. We do have NSAIDs to help reduce pain and maybe inflammation at the source, but the results vary per individual and they can not be used for a long time. For example, aspirin blocks the production of chemicals that bind to pain receptors. Opioids mimic the effect of endorphins, blocking neuron signals. These medications only temporarily block the pain to give relief, but they don't solve the problem itself.