Division of nervous system and its function

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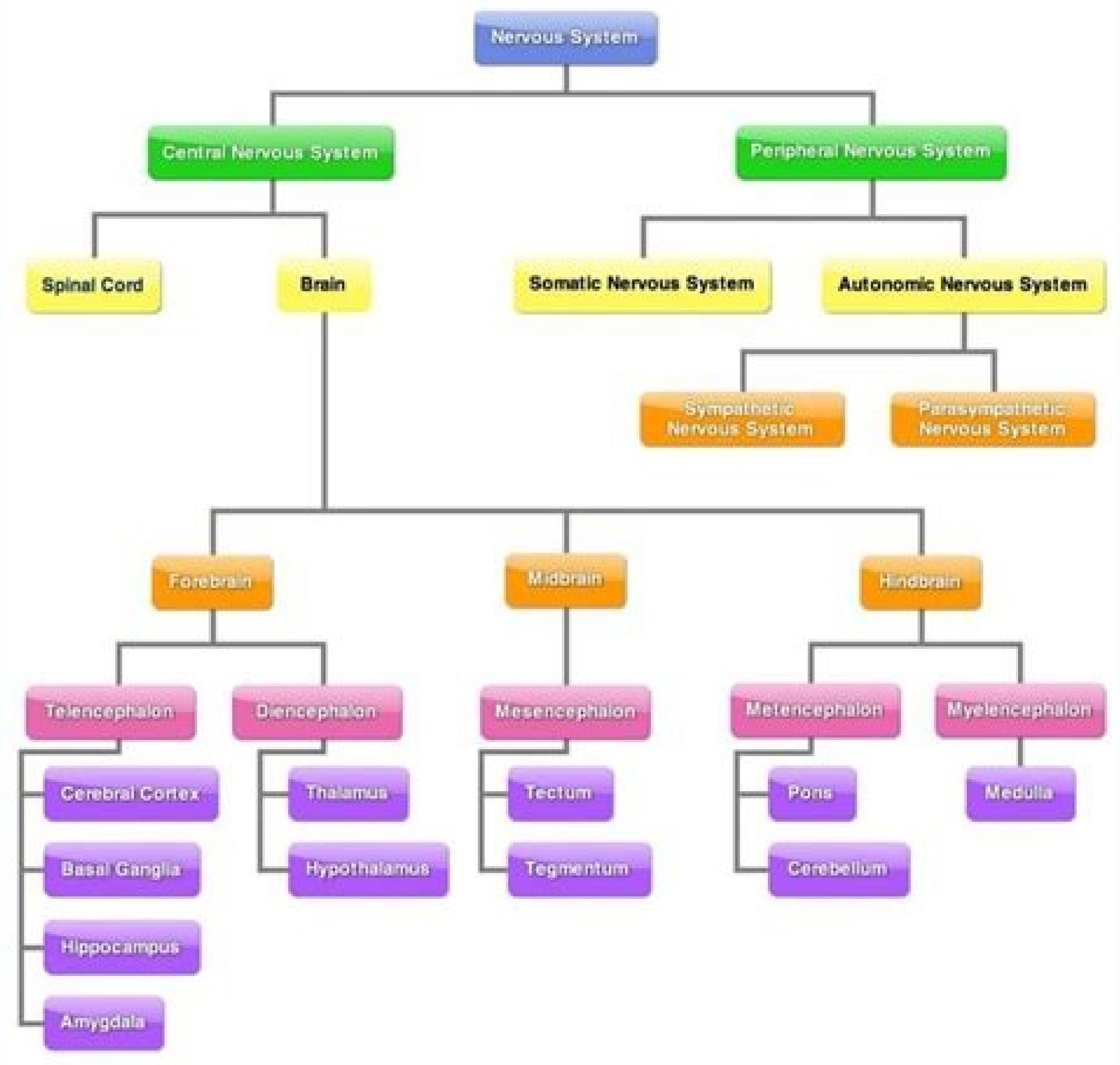
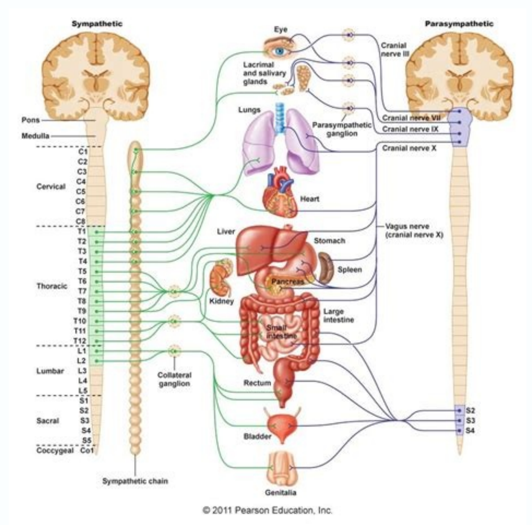




Nervous System Assignment

Section 8.1

1. The 3 specific functions of the nervous system are ______*sensory input*______, ______*integration*______, and ______*motor output*______.

2. The 2 major divisions of the nervous system are the ___*central nervous system*___ which consists of the ____*brain*______ and ___*spinal cord*___, and the ___*peripheral nervous system*______ which consists of the ___*cranial nerves*____ and ______*spinal nerves*______.

3. Name the 2 types of cells found in nervous tissue and give their functions.

Neurons- transmit nerve impulses *Neuroglia – support and nourish neurons*

4. The 3 major parts of a neuron are the ______*cell body*______, ______*dendrites*______ and ______*axon*______.

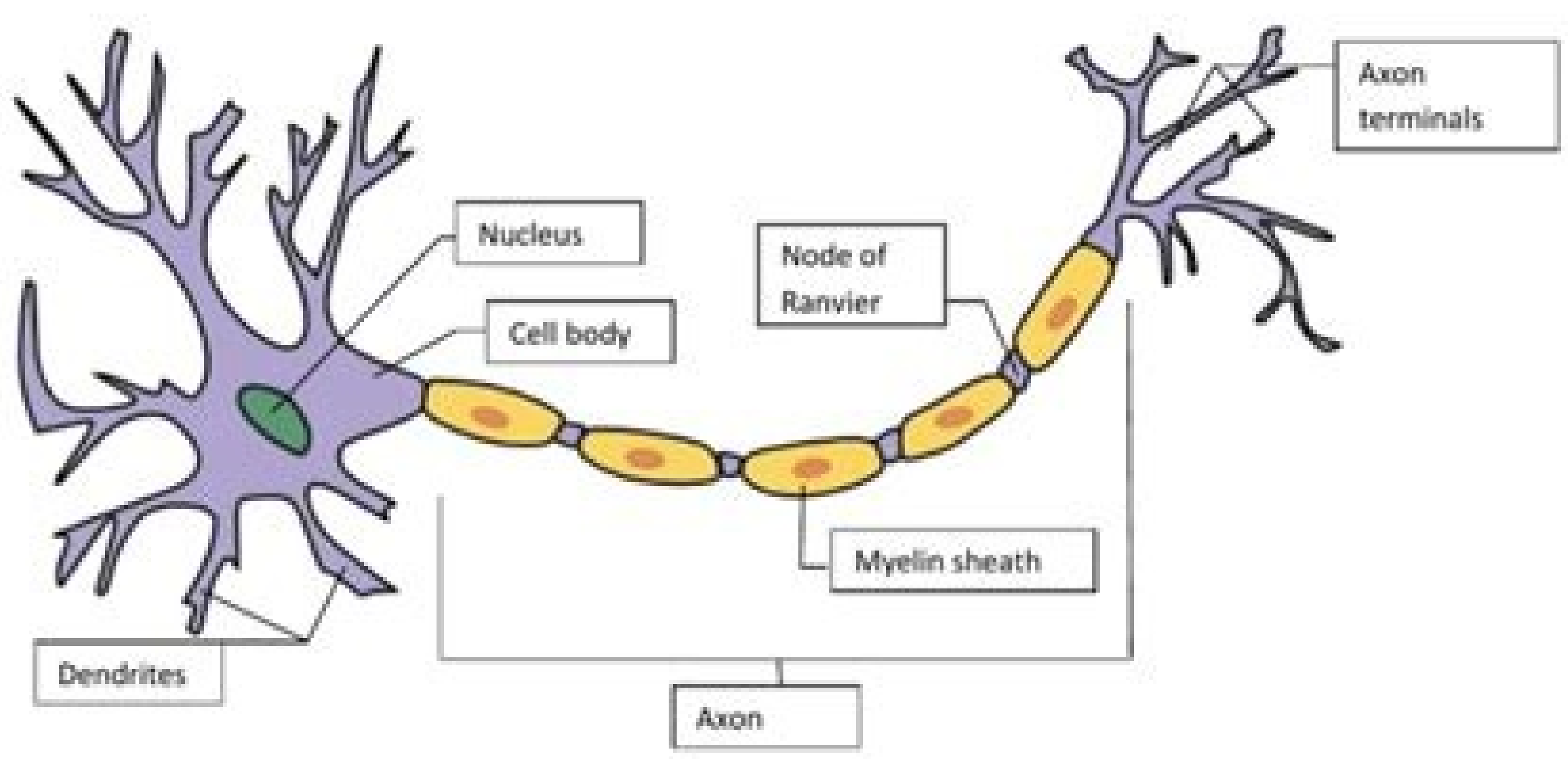
5. What is a nerve? *a bundle of axons in the PNS*

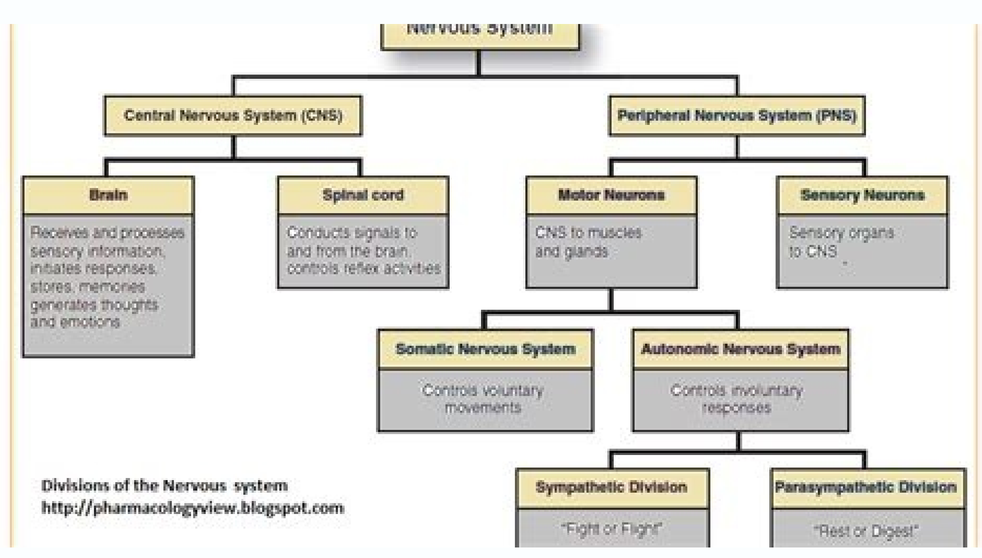
6. What is a tract? *a bundle of axons in the CNS*

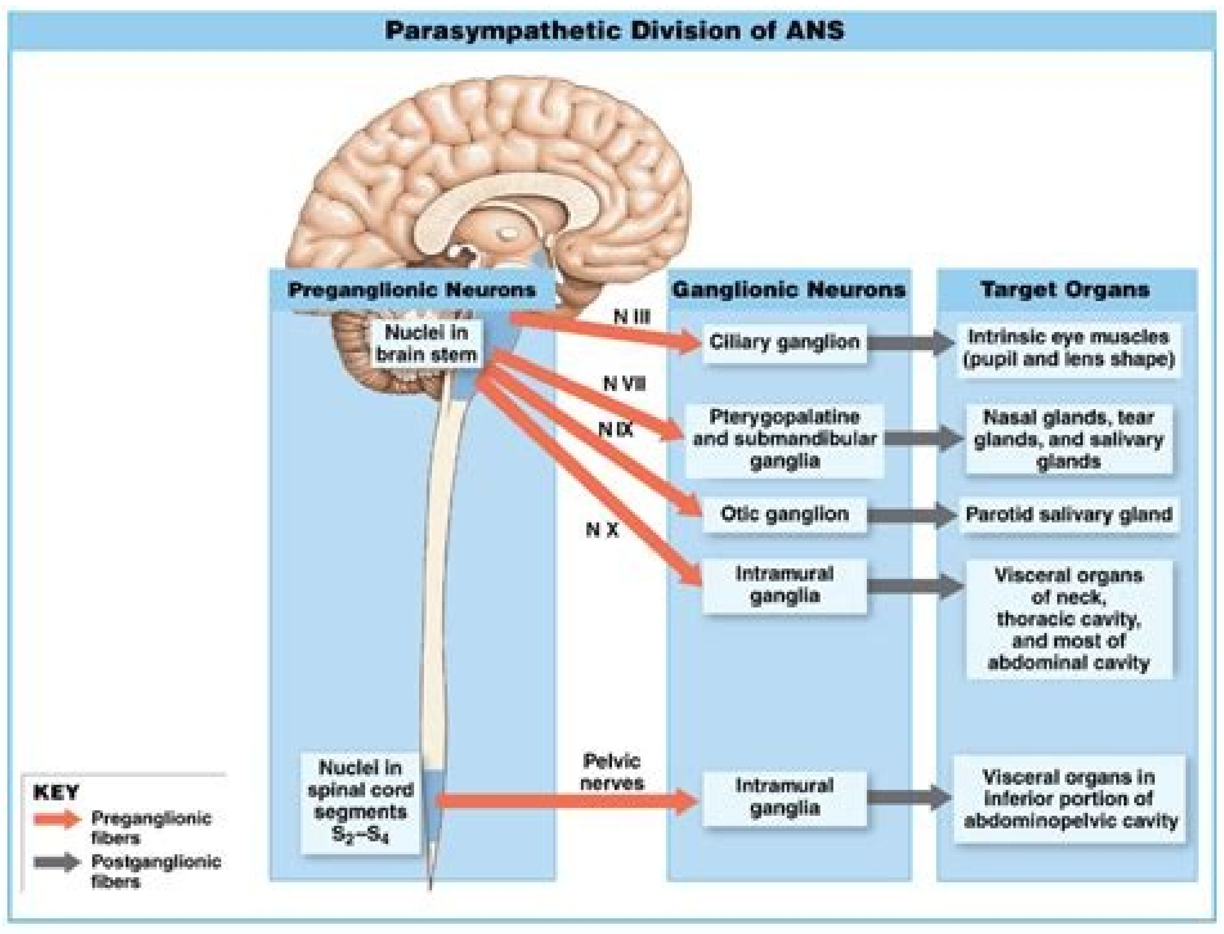
7. How do nerves and tracts differ from each other?

Location

8. Label the following diagram of a myelinated neuron.







What are the main division of the nervous system. What are the divisions of the nervous system.

The brain is at the center of our nervous system. It sits atop our heads, where it sends and receives important messages. These messages travel through our nerves and inform our actions. Conversely, our brains also react to neural messages that it receives from our nerves. These neurons communicate quickly back and forth. When our fingertips graze over something hot, our brain gets the information instantly and tell us to pull our hand away. The brain and the nerves work together constantly to keep us in check. Anything that seems instinctual or automatic is due to the nervous system. When we right ourselves after a moment of falling, this is due to the cerebellum. When we feel hunger or thirst after a while of fasting, this is due to the hypothalamus. Or when we feel the sudden urge to run away during stressful situations, this is due to the amygdala. The main route that nerves travel down, before branching off to their repsective body parts, is the spinal cord. The spinal cord extends from the brain down to the tail bone. Though it is a bundle of nervous, many nerves branch off and continue along to places like our arms and legs. Your nervous system helps you regulate your voluntary and involuntary actions, as well as thinking, communicating, and memory. Your autonomic nervous system is the aspect of the nervous system that controls all of your vital functions, like breathing, digestion, and heart rate—many of which you aren't consciously aware of. In short, it keeps you alive. Ian Cuming / Getty Images It's probably a good thing that your autonomic nervous system is out of your conscious control. If you fall when learning to walk, you may temporarily injure yourself, but you generally learn how to pick yourself up and start again. Can you imagine if you had to learn how to speed up your heart whenever you needed to? Or if you stopped breathing every time you forgot to breathe? While few diseases attack the autonomic nervous system alone, almost all medical disorders have some impact on autonomic functions. Your autonomic nervous system includes a craniosacral parasympathetic portion and a thoracolumbar part sympathetic portion. These are sometimes thought of as being opposite to each other, ultimately striking a balance within the body. The sympathetic and parasympathetic functions: The parasympathetic is associated with rest and digestion. Its main function is to conserve the body's energy and to help you sleep or break down and absorb the food you eat.The sympathetic is responsible for the "fight or flight" response that helps you quickly use your body's energy in an emergency situation—like running away from danger. The nerves of the autonomic nervous system synapse in a clump of nerves called a ganglion before the message is transmitted to the target organ, such as a salivary gland. This allows for another level of communication and control. The autonomic nervous system has many functions. The parasympathetic system performs basic housekeeping and controls things when you are at rest. The sympathetic system is the emergency system and helps you carry out life-saving flight or fight responses. Many nerves of the parasympathetic portion of the autonomic nervous system begin in the nuclei in your brainstem. From there, they travel through cranial nerves such as the vagus nerve, which slows the heart rate, or the oculomotor nerve, which constricts the pupil of the eye. Parasympathetic stimulation also causes your eyes to tear and your mouth to salivate. Other parasympathetic nerves terminate in the walls of thoracic and abdominal organs like the esophagus, gastrointestinal tract, pharynx, heart, pancreas, gallbladder, kidney, and ureter. The sacral parasympathetic nerves synapse in ganglia in the walls of the colon, bladder, and other pelvic organs. Sympathetic fibers of the autonomic nervous system exit the lateral (side) part of your spinal cord. They receive information from parts of the brain such as the brainstem and the hypothalamus. Fibers run from synapses in ganglia just outside the spinal column to their targets, usually along blood vessels. For example, the sympathetic nerves that dilate your pupils exit the spinal cord in your neck and synapse in the ganglion called the superior sympathetic ganglion, they then run along the carotid artery to your face and eye. The sympathetic nervous system supplies nerves to the abdominal and pelvic visceral organs, as well as hair follicles, sweat glands, and more. The nervous system communicates through chemical messengers called neurotransmitters. Neurotransmitters like acetylcholine and norepinephrine are primarily responsible for communication in your autonomic nervous system. In both the parasympathetic and sympathetic parts of the autonomic system, acetylcholine is released at the level of the ganglia.Acetylcholine receptors in ganglia are nicotinic and may be blocked by drugs such as curare.In the parasympathetic nervous system, postganglionic receptors in organs such as the gastrointestinal tract are called muscarinic and are susceptible to drugs such as atropine.The post-ganglionic sympathetic neurons release norepinephrine. The norepinephrine released by the post-ganglionic neurons binds to adrenergic receptors. There are two main categories of adrenergic receptors, alpha, and beta, each of which has subcategories with their own unique properties and can be manipulated by different types of medication. Neurotransmitters of the autonomic nervous system mediate important functions of the body, and these actions can also be regulated by medications that inhibit or stimulate these actions. Blood pressure is a good example of how the sympathetic and parasympathetic components of the nervous system work together within the body. In general, there are two main things that cause blood pressure to go up: The speed and force of your pumping heart, and the narrowness of the blood vessels in your body. When sympathetic nervous system activity dominates, your heart pumps hard and quickly, your peripheral blood vessels are narrow and tight, and your blood pressure will be high.The parasympathetic system slows the heart and widens peripheral blood vessels, causing the blood pressure to fall. Imagine that you stand suddenly after having been in a seated position for a long time. Receptors in blood pressure walls at the carotid sinus and aortic arch sense the change in pressure and send messages to the brainstem, which responds appropriately by increasing your blood pressure. In other cases, you may need your blood pressure to rise because you are, say, terrified by an angry bear and you need quick energy to be able to run away. Even before you start to run, your brain has recognized the bear and sent messages to your hypothalamus to prepare your body to spring into action. Sympathetics are activated, the heart starts pounding, and the blood pressure begins to rise, providing you with oxygen and glucose to power your muscles so you can run as fast as possible. While there are other systems that can control blood pressure, such as hormones, these tend to be gradual and slow, not immediate like those controlled directly by your autonomic nervous system. Most of the time, your autonomic nervous system works very well. However, the fight or flight response may become activated with small everyday stresses, releasing a lot of the stress hormone cortisol and driving your blood pressure and heart rate up unnecessarily. For most of us, the autonomic nervous system is generally out of our conscious control. In the brainstem, the nucleus tractus solitarius is the main command center for the autonomic nervous system, sending input largely through cranial nerves IX and X. The cerebral cortex of your brain, normally associated with conscious thought, can change your autonomic nervous system to some degree—usually involuntarily, but sometimes voluntarily. In the cerebral cortex, the insula, anterior cingulate cortex, substantia innominata, amygdala, and ventromedial prefrontal cortex are areas that help you understand the events that are going on around you, as well as your emotions. These regions communicate with your hypothalamus to impact the actions of your autonomic nervous system. Because the cerebral cortex is linked to the autonomic nervous system, you may be able to control your autonomic nervous system through conscious effort, especially with some practice. Practices like yoga, mindfulness, and meditation can help you manage your physical autonomic nervous system activity. Highly trained people, such as advanced yoga practitioners, may be able to intentionally slow their heart rate or even control their body temperature. Mindfulness and meditation can have similar effects. For most of us, though, focusing on things that are relaxing rather than stressful, or just taking a slow, deep breath when you notice that you're feeling anxious or your heart is racing can bring your autonomic nervous system back into a degree of control. The nervous system is an organ system that handles communication in the body. There are four types of nerve cells in the nervous system: sensory nerves, motor nerves, autonomic nerves and inter-neurons (neuron is just a fancy word for nerve cell). You can divide up all the nerves in the body into roughly two parts: the central nervous system and the peripheral nervous system. Science Photo Library - PASIEKA / Brand X Pictures / Getty Images The central nervous system contains two organs—the brain and the spinal cord. It has all four types of nerve cells and is the only place you can find inter-neurons. The central nervous system is insulated from the outside world pretty well. It never even touches blood. It gets its nutrients from cerebrospinal fluid, a clear liquid that bathes the brain and spinal cord. Both organs are covered with three layers of membranes called the meninges. CITE The meninges and cerebrospinal fluid cushion the brain to keep it from being injured by a knock on the noggin. It's possible to get an infection from viruses or bacteria in the meninges called meningitis. It's also possible to have bleeding either between the meninges and the skull (called an epidural hematoma) or in between the layers of the meninges (called a subdural hematoma). Any bleeding or infection inside the skull can put pressure on the brain and cause it to malfunction. The central nervous system is like the guts of your computer. It's in there with millions of connections moving little impulses around from circuit to circuit (nerve to nerve), calculating and thinking. Your brain makes all the calculations and stores information. Your spinal cord is like a cable with lots of individual wires running to all different parts of the brain. But the computer brain inside your laptop, like the brain inside your head, is useless all by itself. You have to be able to tell your computer what you need and see or hear what your computer is trying to tell you. You need some sort of input and output devices. Your computer uses a mouse, a touchscreen or a keyboard to sense what you want it to do. It uses a screen and speakers to react. Your body works very similarly. You have sensory organs to send information to the brain—eyes, ears, nose, tongue, and skin. To react, you have muscles that make you walk, talk, focus, wink, stick your tongue out—whatever. Your input/output devices are part of your peripheral nervous system. The peripheral nervous system is everything connected to the central nervous system. It has motor nerves, sensory nerves, and autonomic nerves. Autonomic nerves act automatically, which is a way to remember them. They are the nerves that regulate our bodies. They are the body's version of a thermostat, a clock, and a smoke alarm. They work in the background to keep us on track and healthy, but they don't take up brain power or need to be controlled. Autonomic nerves are loosely split into either sympathetic or parasympathetic nerves. Sympathetic nerves have a tendency to speed us up. They increase heart rate, breathing, and blood pressure. These nerves are responsible for the fight-or-flight response.Parasympathetic nerves stimulate blood flow to the gut. They slow down the heart and decrease blood pressure. Think of the sympathetic nerves as the body's accelerator, and parasympathetic nerves as the brake pedal. Your body is always stimulating both the parasympathetic side and the sympathetic side at the same time—just like my grandmother used to drive, with a foot on each pedal. Motor nerves start from the central nervous system and go out toward the far reaches of the body. They're called motor nerves because they always end in muscles. If you think about it, the only signals your brain sends to the outside world consist of making things move. Walking, talking, fighting, running, or singing all take muscles. Sensory nerves go the other direction. They carry signals from the outside toward the central nervous system. They always start in a sensory organ—eyes, ears, nose, tongue or skin. Each of those organs has more than one type of sensory nerves—for instance, the skin can sense pressure, temperature, and pain. The spinal cord is the connection between the central nervous system and the peripheral. It is technically part of the CNS, but it is how most of the motor and sensory nerves get to the brain. Inside the spinal cord are some of those inter-neurons mentioned above. In the brain, inter-neurons are like the microscopic switches in a computer chip, helping to make calculations and do the heavy thinking. In the spinal cord, inter-neurons have a different function. Here they act like a planned short circuit, letting us react to some things faster than we could if the signal had to travel all the way to the brain and back. Inter-neurons in the spinal cord are responsible for reflexes—the reason you jerk back when you touch a hot pan before you even realize what happened. Nerves carry messages via signals called impulses. Like a computer the signal is binary; it's either on or off. A single nerve cell can't send a weaker signal or a stronger signal. It can change frequency—ten impulses per second, for example, or thirty—but each impulse is exactly the same. Impulses travel along a nerve in exactly the same way as muscle cells contract, through chemistry. Nerve cells use ionized minerals (salts like calcium, potassium, and sodium) to propel the impulse along. I won't get too deep into the physiology, but the body needs a proper balance of all three of these minerals for the process to work correctly. Too much or too little of any of these and neither muscles nor nerves will function properly. Nerve cells can be pretty long, but it still takes several to reach from the tip of your finger to your spinal cord. The cells don't touch each other. Instead, the impulse is chemically sent (transmitted) from one nerve cell to the next using substances known as neurotransmitters. Adding neurotransmitters to the bloodstream can cause nerves to send signals. For example, many of the sympathetic nerve cells mentioned above (the fight-or-flight cells) react to a neurotransmitter called adrenaline, which is released into the bloodstream from the adrenal glands when we get scared, stressed, or startled. If you have a solid grasp of how the nervous system works, it's a small leap to understanding why certain substances or medications affect us the way they do. It's also easier to understand how strokes or concussions affect the brain. The body is a dynamic collection of chemicals constantly interacting. The nervous system is the most basic of those interactions. This is the foundation for understanding physiology as a whole.

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