1. Put all your knowledge together. Collaborate with those around you to create a flow chart and/or diagram of the propagation of a signal due to your finger being stung by a bee. At the LEAST, include in your answer: the type of receptor, the mechanics of an action potential (location in the neuron, values, types of channels, and ions), the mechanics at the synapse, the pathway/tract to the brain, # of efferent neurons, type of effector receptor, and anything else you think needs to be included. This question is meant to be challenging, ask Molly if you have a question!

Mechanoreceptor (Free Nerve Ending) Detects Pain

↓

Action Potential Travels along afferent sensory axon ↓ (Saltatory conduction)

Action Potential reaches synapse ↓

Voltage-gated Ca²⁺ channels open + Ca²⁺ enters pre-synaptic cell ↓

Ca²⁺ triggers release of neurotransmitter vesicles into synaptic cleft ↓

Neurotransmitters bind receptors on post-synaptic cell, repeat Action Potential steps ↓

Signal travels up spinal cord via Dorsal column-medial lemniscal pathway ↓

Signal decussates in medulla + travels to the primary somatosensory area via the thalamus

Neurotransmitter binds to ligand-gated Channels on dendrites/soma

↓

Graded potential occurs ↓

Depolarization of the soma ↓

Voltage-gated Na⁺ channels open @ axon hillock ↓

Membrane voltage reaches -55 mV ↓

Depolarization until +30 mV membrane when Na⁺ inactivate + voltage-gated K⁺ channels open ↓

Membrane repolarizes past -70 mV + hyperpolarizes to -90 mV + K⁺ channels close ↓

Na⁺/K⁺ ATPase pump pumps 3Na⁺ out + 2K⁺ in, returning the membrane to -70 mV

(You can use the next page, too)
Signal travels to primary motor cortex
Signal travels back down the spinal cord
Signal propagates action potentials along efferent neurons
Neurotransmitter binds muscarinic cholinergic receptor on effector cell
You pull your hand back in response to the bee sting