**POE #4: Bear Reaction**

**Topic**

Unit 4- Nervous System and Connections

The scenario below has been simplified for the purposes of this introductory anatomy and physiology course. As you progress in your academic and professional careers you may learn more extensive details related to this scenario.

**Introduction to the Scenario**

*As you read through the scenario below underline specific facts and information you find important to the situation*

It’s a clear, sunny day, so you decide to embark on a solo hiking adventure. As you set out into the woods, you find some inner peace. You continue to wander through the relaxing views and sounds of nature. Your body is not under stress, and you are able to maintain a steady comfortable pace. After hiking out for 3 miles, you decide to start heading back. While turning a blind corner, you hear a booming roar and out of the corner of your eye, you notice the creature in the image below:

You have encountered a bear protecting her cubs. The bear is about 50 meters from you blocking your only path back to the trailhead. Immediately you experience drastic changes in your physiological state as your body enters survival mode. The bear walks toward you triggering your fight or flight response. You slowly back away hoping to diffuse the situation, and after a few minutes, the bear finally turns around. You begin sprinting as fast as you can back up the trail to avoid another potentially fatal encounter.

**Driving Question(s)**

What nervous system pathways are involved in this bear encounter? What physiological changes occur to prepare your body to handle the potential bear attack?

**Initial Hypotheses/Predictions**

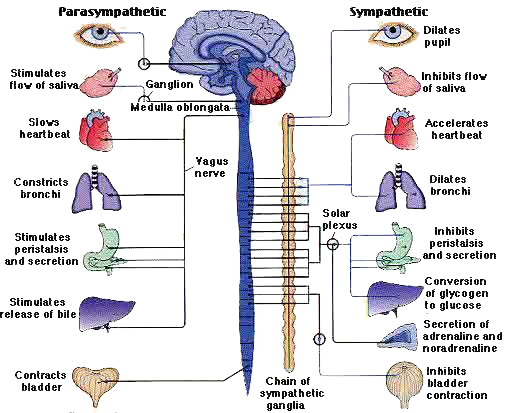
*In the box below, please provide your initial ideas about a possible answer to the driving question(s) above.*

**Relevant Data & Analysis Questions**

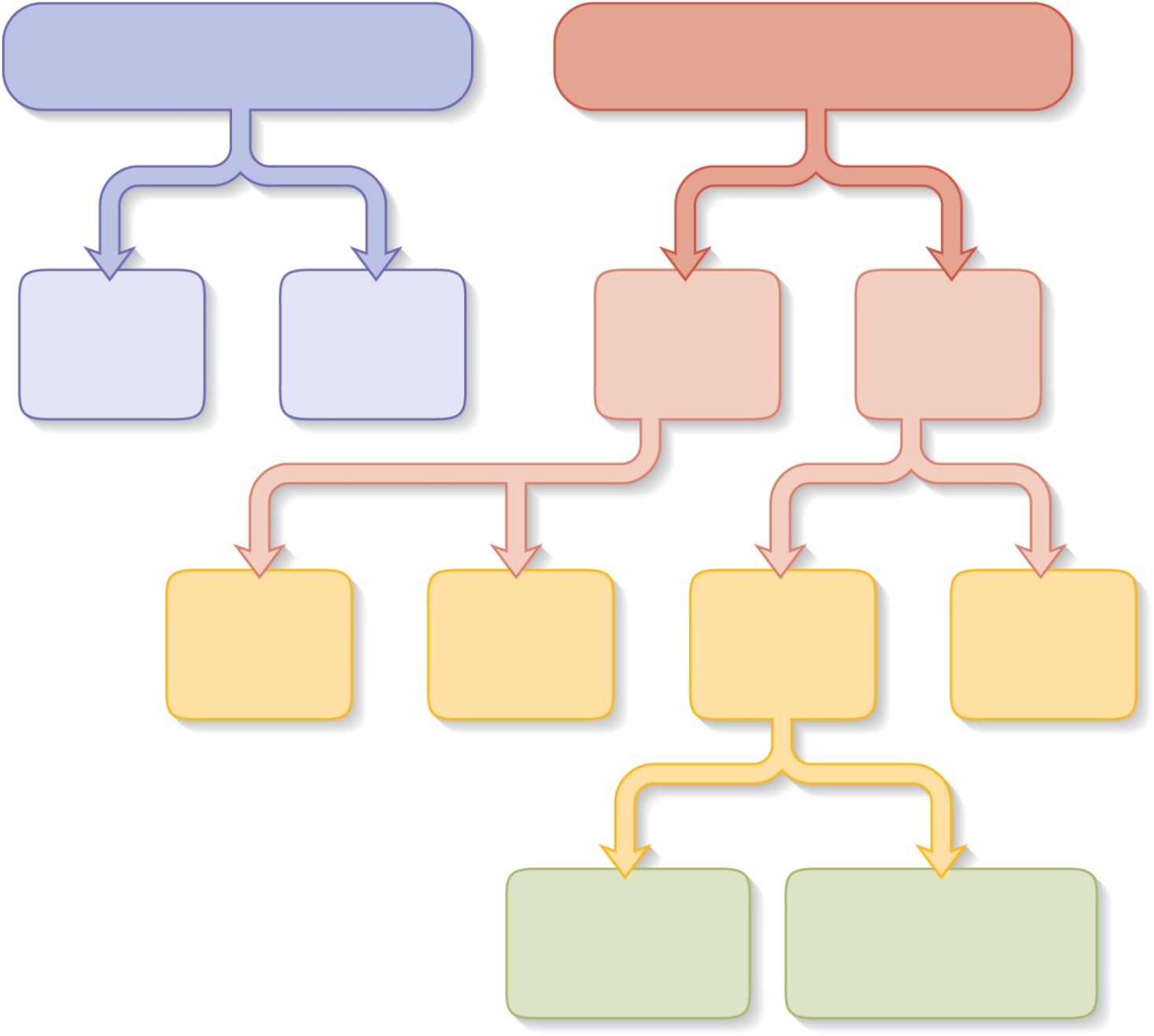
***ALL analysis questions are italicized in the pages below***

**Parasympathetic Nervous System and Sympathetic Nervous System**

***CIRCLE*** *responses in the image below that would occur during the bear encounter described above.*

******

*Complete the chart below by filling in the correct divisions of the nervous system:*



**Central Nervous System**

**Peripheral Nervous System**

*Describe the difference between ascending tracts and descending tracts (Describe the signals and neurons each tract is associated with). Name the specific tracts involved in afferent and efferent pathways?*

In response to the bear encounter, the body will undergo multiple nervous system changes. In each task below you will describe the nervous system pathways and responses as they relate to different bodily systems.

1. *Trace the afferent pathway from hearing the bear’s booming roar to the integration center in the brain.*

***Afferent Hearing Pathway:***

**Stimulus:**

**Hear the booming roar**

**Sensor in the Ear:**

**Perceiving Nerve:**

**Brain Structure (relay center):**

**Brain Structure (integration center):**

**Brain Lobe:**

1. *Trace the afferent pathway from spotting the bear in the corner of your eye to the integration center in the brain.*

***Afferent Vision Pathway:***

**Stimulus:**

**Spotting the bear in corner of eye**

**Sensors in the eye:**

**Perceiving Nerve:**

**Brain Structure (integration center):**

**Brain Lobe:**

**Read This Before Continuing:**

**Various sensory receptors perceive information about the external environment such as stress, threats, and danger. The axons leading from these receptors transmit this information to the brain through afferent pathways. In various regions of the brain, for example, the pons, thalamus, amygdala, hypothalamus, and different lobes, these sensory signals are integrated, processed, and turned into motor signals that are sent to effectors through efferent pathways.**

1. *What neurotransmitters/ hormones would be released during an SNS response? What receptor types would these NTs bind to in order to illicit an excitatory response?*
2. *Trace the efferent pathway from the thalamus/temporal lobe (which perceives the bear’s roar) to the areas in the brain that signal muscles of the eyes, head, and neck to turn toward the source of the sound (i.e. the bear).*

**Integration Center:**

**Thalamus/ Temporal Lobe**

**Brain Structure & Gyrus:**

**Brain Gyrus:**

**Muscles Stimulated:**

**Spinal Tract:**

1. *Trace the efferent pathway from the thalamus/occipital lobe (which visually perceives the bear) to the areas of the brain that signal muscles of the eyes, head, and neck to turn toward and fully view the bear.*

**Integration Center:**

**Thalamus/ Occipital Lobe**

**Brain Structure & Gyrus:**

**Brain Gyrus:**

**Muscles Stimulated:**

**Spinal Tract:**

1. *Trace the efferent pathway from the visual/hearing integration centers in the brain to the muscles in the legs that will allow you to run away from the bear.*

**Integration Centers:**

**Thalamus**

**Occipital Lobe**

**Temporal Lobe**

**Brain Gyrus:**

**Brain Gyrus:**

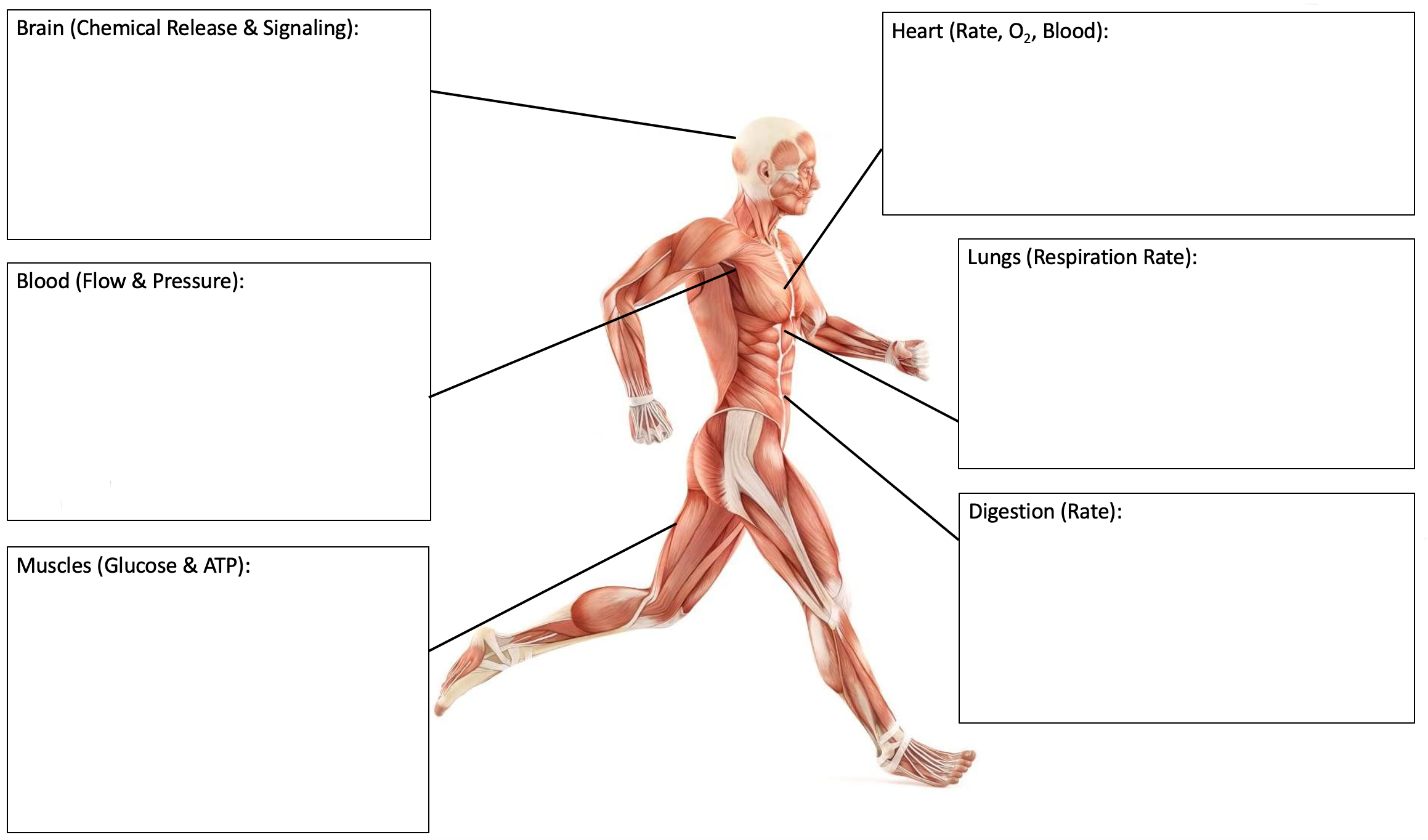
**Muscles Stimulated:**

**Neurons:**

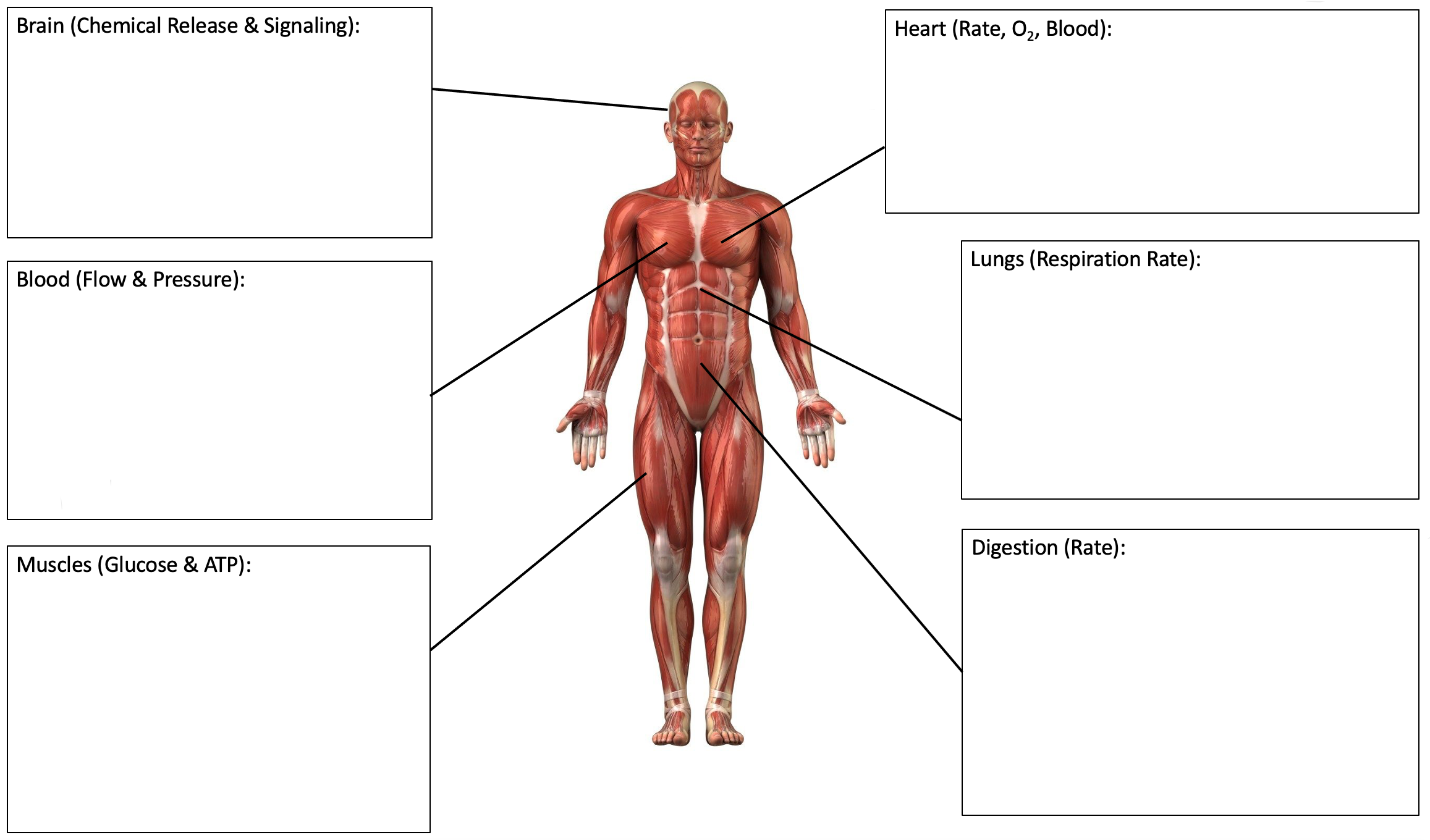
*What are some differences between the Parasympathetic Nervous system and Sympathetic Nervous System?*

*Describe what is happening to each body system or body part in the models labelled below during an SNS (Sympathetic) response and during a PNS (Parasympathetic) response.*

**SNS (Fight or Flight) Response**

****

**PNS (Rest & Digest) Response**



*Fill out the POE comparison chart below comparing and contrasting prior POEs with the current POE.*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| *POE #* | *Homeostatic Control* | *Important Hormones/ Neurotransmitters Involved* | *Important Ions Involved (If applicable)* | *Nervous System Involvement* |
| *Unit #1: Type 1 Diabetes*  *(Blood Glucose)* |  |  |  |  |
| *Unit #2: Hypoparathyroidism*  *(Blood Calcium)* |  |  |  |  |
| *Unit #3: Botulinum Toxin (Neuromuscular Junction)* |  |  |  |  |
| *Unit #4: Nervous System Control (SNS & PNS)* |  |  |  |  |

**Observations**

*After examining the data and answering the analysis questions above, describe interesting observations and patterns you believe are relevant to explaining the scenario. You can include both textual and visual observations in order to help organize the data from above. (Include at least 10 important pieces of data and evidence that will aid in your final explanation of the scenario below)*

**Explanation**

*Based on the data and analysis questions above, please provide an answer to the driving question(s) in the box below. Remember to include data from above as evidence, important ideas from previous units, and the concept of homeostasis in your response.*

**Driving Question(s)**

*What nervous system pathways are involved in this bear encounter? What physiological changes occur to prepare your body to handle the potential bear attack? Explain how your nervous system controls organ systems and bodily processes in order to adapt during the bear encounter.*