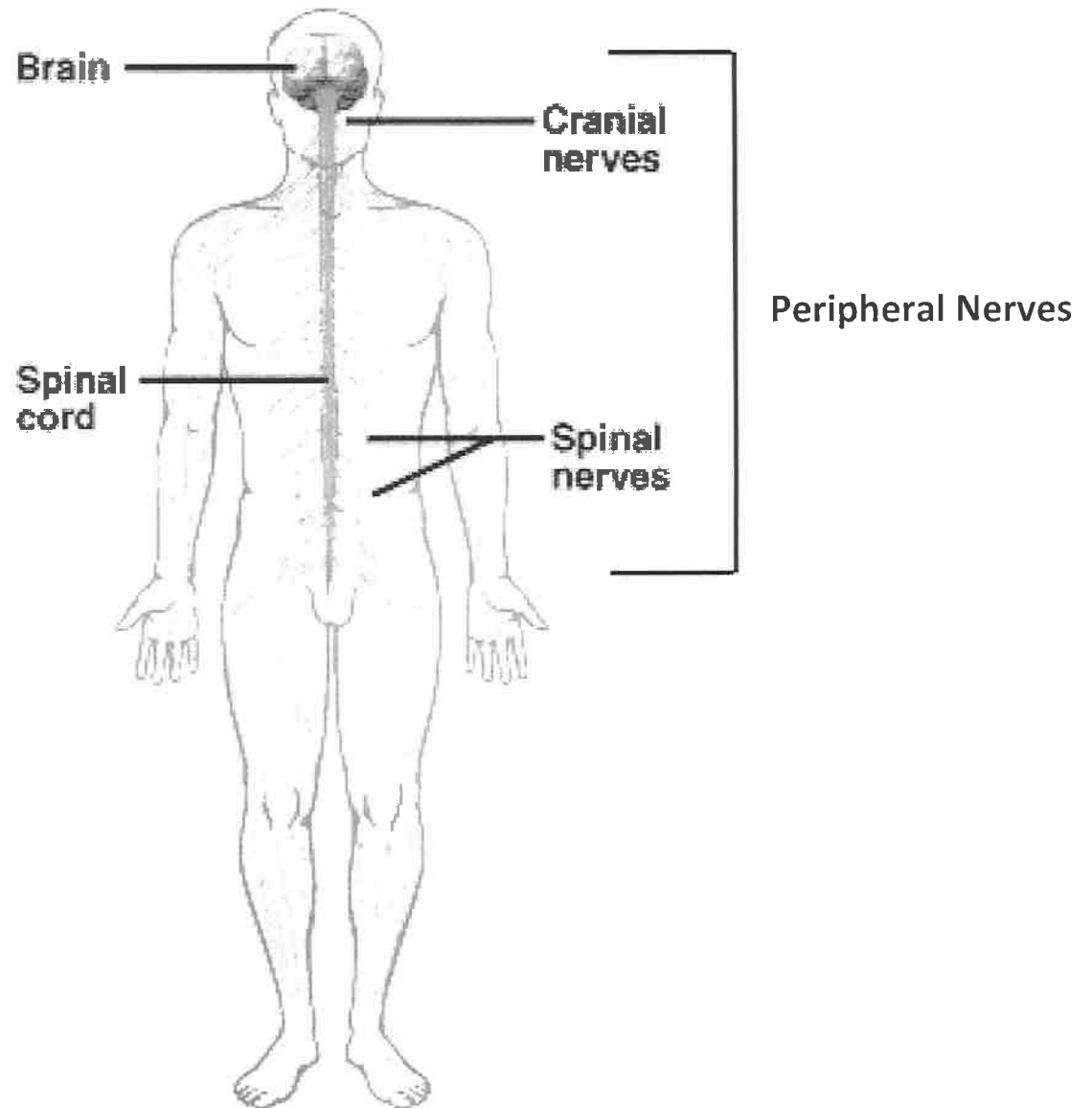


# Station 1 - Nervous System

- Use the diagram to the right to fill out the first section of your notes.



# **Station 1**

## **Functions of the Nervous System**

- 1. Read Section 9.2 in your text (p. 207)**
- 2. Continuing in your notes, list the 3 functions of the nervous system. Make sure to match the function with the description/image provided and fill in the remaining parts of the descriptions.**

## **Station 2**

# **Divisions of the Nervous System**

- 1. Using the computer/iPad and headphones, go to the following website and watch the video: <https://www.youtube.com/watch?v=zeo19WVQ47w>**
- 2. Use the information provided in the video to fill in your notes.**

# **Station 3**

## **Nervous Tissue and Neuroglial Cells**

- 1. Use the diagrams and information provided to fill in your notes regarding *Nervous Tissue* and the chart for Neuroglial Cells.**

# Station 3 - Nervous Tissue

- Neurons – nerve cells that are specialized to react to physical and chemical changes in their surroundings
  - Structural and functional units of the nervous system
  - Transmit info to other cells in the form of electrochemical changes called nerve impulses
- Neuroglial Cells – cells that provide support, insulation, protection, and nutrients for neurons

# Station 3 - Neuroglial Cells

## Neuroglia

*are found in*

### Peripheral Nervous System

### Central Nervous System

*contains*

*contains*

#### Schwann cells

Surround all axons in PNS; responsible for myelination of peripheral axons; participate in repair process after injury



#### Oligodendrocytes

Myelinate CNS axons; provide structural framework



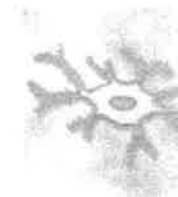
#### Astrocytes

Maintain blood-brain barrier; provide structural support; regulate ion, nutrient, and dissolved-gas concentrations; absorb and recycle neurotransmitters; form scar tissue after injury



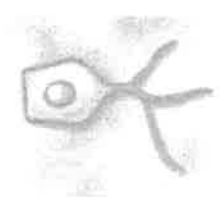
#### Microglia

Remove cell debris, wastes, and pathogens by phagocytosis



#### Ependymal cells

Line ventricles (brain) and central canal (spinal cord); assist in producing, circulating, and monitoring cerebrospinal fluid



# NEUROGLIA

are found in

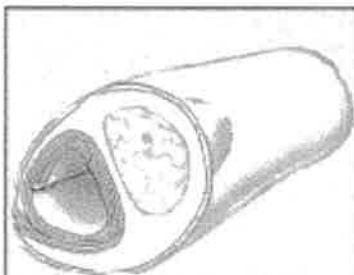
**Peripheral  
Nervous System**

**Central Nervous System**



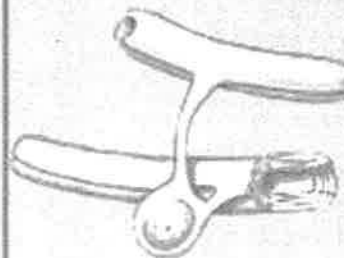
**Ependymal cells**

- Line ventricles (brain) and central canal (spinal cord)
- Assist in producing, circulating, and monitoring of cerebrospinal fluid



**Schwann cells**

- Surround axons in PNS
- Are responsible for myelination of peripheral axons
- Participate in repair process after injury



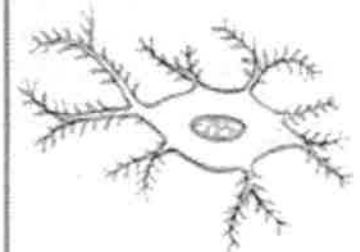
**Oligodendrocytes**

- Myelinate CNS axons
- Provide structural framework



**Astrocytes**

- Maintain blood-brain barrier
- Provide structural support
- Regulate ion, nutrient, and dissolved gas concentrations
- Absorb and recycle neurotransmitters
- Form scar tissue after injury



**Microglia**

- Remove cell debris, wastes, and pathogens by phagocytosis

# Nervous System Cells






Two types of cells make up the nervous system: **neurons** and **neuroglia**. Neurons are the excitable, impulse-conducting cells that perform the work of the nervous system, while neuroglia protect the neurons.

## Neuroglia

Also called **glial cells**, **neuroglia** are the supportive cells of the nervous system. (The word *glia* means “glue,” and neuroglia do just that: they bind neurons together.) They also perform various functions that enhance the performance of the nervous system. Underscoring the importance of neuroglia is the fact that the nervous system contains about 50 glial cells for each neuron.

The nervous system contains five major types of glia. Diverse in shape as well as function, the following table summarizes each type. Schwann cells are found in the peripheral nervous system; all the rest reside in the central nervous system.

### Types of Glial Cells

Cell Type	Function
<b>Neuroglia of CNS</b>	
Oligodendrocytes 	Form myelin sheath in the brain and spinal cord; speed signal conduction
Ependymal cells 	Line spinal cord and cavities of the brain; secrete cerebrospinal fluid
Microglia 	Perform phagocytosis, engulfing microorganisms and cellular debris
Astrocytes 	Extend through brain tissue; nourish neurons; help form blood-brain barrier; attach neurons to blood vessels; provide structural support
<b>Neuroglia of PNS</b>	
Schwann cells 	Form myelin sheath around nerves in PNS; form neurilemma

### The Body AT WORK

*Star-shaped astrocytes—the most numerous of all glial cells—are pervasive throughout the brain. A tiny “foot” exists at the end of each of the astrocyte’s star-like projections. Some of the feet latch onto a capillary while others connect with a neuron. This arrangement allows the astrocyte to funnel glucose from the bloodstream to the neuron for nourishment. What’s more, the feet of the astrocytes join with the endothelial cells lining the walls of capillaries to create a semi-permeable membrane called the **blood-brain barrier (BBB)**. The BBB, which exists throughout the brain, allows small molecules (like oxygen, carbon dioxide, and water) to diffuse across to the brain but blocks larger molecules. This helps protect the brain from foreign substances. However, it also prevents most medications from reaching brain tissue, making treating disorders of the brain challenging.*

### Life lesson: Brain tumors

Unlike neurons, which don’t undergo mitosis, glial cells retain the ability to divide throughout life. While this allows them to replace worn-out or damaged cells, it also makes them susceptible to tumor formation. In fact, most adult brain tumors consist of glial cells. These types of tumors—called *gliomas*—are highly malignant and grow rapidly. Because of the blood-brain barrier (see “The Body at Work” on this page), most medications aren’t effective in treating these tumors. While researchers work to perfect chemotherapies that can target these tumors, surgery and radiation continue to be treatment mainstays.



# **Station 4 - Types of Neurons**

- 1. Read the section, “Classification of Neurons,” in your textbook (p. 211-212), and use the information to fill out the chart in your notes.**
- 2. When your chart is filled out, see Ms. Steffen for an extra handout to check/compare your answers.**

## Neurons

Nerve cells called **neurons** handle the nervous system's role of communication. There are three classes of neurons: sensory (afferent) neurons, interneurons, and motor (efferent) neurons. Each neuron type fulfills one of the three general functions of the nervous system.

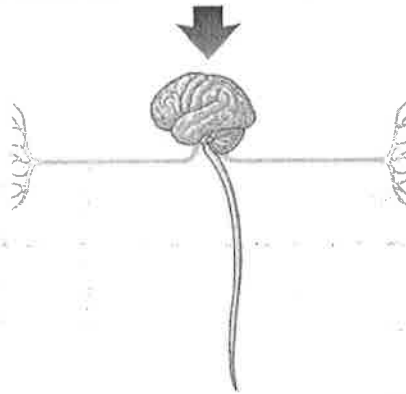
### Sensory neurons

**Sensory (afferent) neurons** detect stimuli—such as touch, pressure, heat, cold, or chemicals—and then transmit information about the stimuli to the CNS.



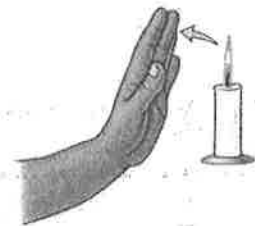
### Interneurons

**Interneurons**, which are found only in the CNS, connect the incoming sensory pathways with the outgoing motor pathways. Besides receiving, processing, and storing information, the connections made by these neurons make each of us unique in how we think, feel, and act.



### Motor neurons

**Motor (efferent) neurons** relay messages from the brain (which the brain emits in response to stimuli) to the muscle or gland cells.

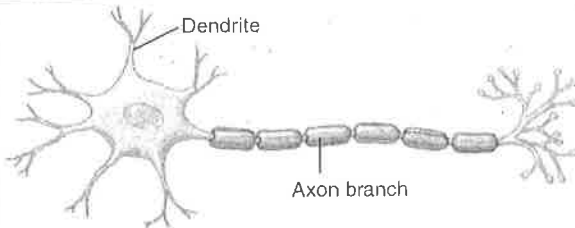


## Types of Neurons

Neurons vary greatly in both size and shape. They also vary according to the type, number, and length of projections.

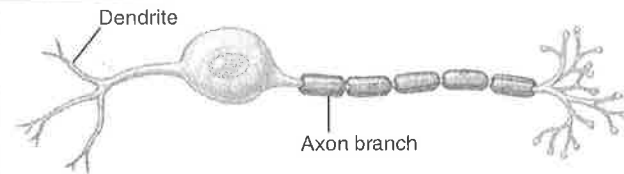
### Multipolar neurons

**Multipolar neurons** have one axon and multiple dendrites. This is the most common type of neuron and includes most neurons of the brain and spinal cord.



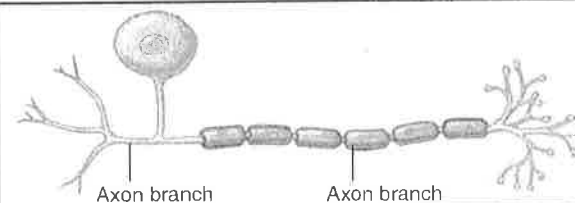
### Bipolar neurons

**Bipolar neurons** have two processes: an axon and a dendrite with the cell body in between the two processes. These neurons can be found in the retina of the eye and olfactory nerve in the nose.



### Unipolar neurons

**Unipolar neurons** have one process—an axon—that extends from the cell body before branching in a T shape. These neurons mostly reside in the sensory nerves of the peripheral nervous system.



### FAST FACT

About 90% of the body's neurons are interneurons.

# **Station 5 - Parts of a Neuron**

- 1. Using the diagrams provided, label the following parts of the neuron in your notes:**
  - Cell body                      -- Dendrite
  - Nucleus                        -- Myelin sheath
  - Axon                            -- Node of Ranvier
- 2. For each part labeled, provide a brief description of that structure's function in the white space next to the label.**

## Neuron Structure

Neurons are perhaps the most diverse of all body cells, assuming a variety of shapes and sizes. In general, though, neurons have three basic parts: a cell body and two extensions called an **axon** and a **dendrite**.

The **cell body** (also called the **soma**) is the control center of the neuron and contains the nucleus.

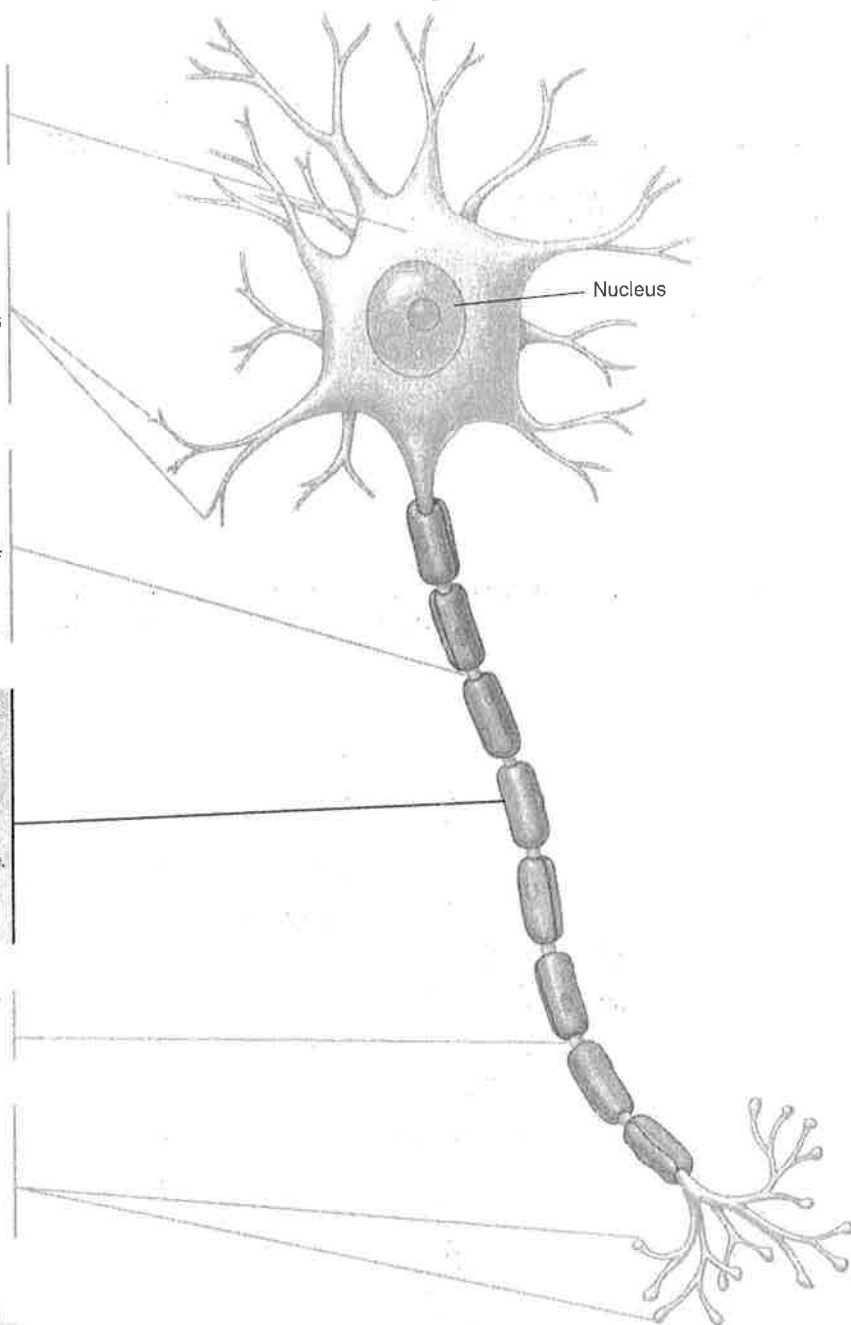
**Dendrites**, which look like the bare branches of a tree, receive signals from other neurons and conduct the information to the cell body. Some neurons have only one dendrite; others have thousands.

The **axon**, which carries nerve signals away from the body, is longer than the dendrites and contains few branches. Nerve cells have only one axon; however, the length of the fiber can range from a few millimeters to as much as a meter.

The axons of many (but not all) neurons are encased in a **myelin sheath**. Consisting mostly of lipid, myelin acts to insulate the axon. In the peripheral nervous system, Schwann cells form the myelin sheath. In the CNS, oligodendrocytes assume this role. (For more information, see "Myelin" on the next page.)

Gaps in the myelin sheath, called **nodes of Ranvier**, occur at evenly spaced intervals.

The end of the axon branches extensively, with each axon terminal ending in a **synaptic knob**. Within the synaptic knobs are vesicles containing a neurotransmitter.



### FAST FACT

The sciatic nerve contains the longest axon in the body; it extends from the base of the spine to the big toe in each foot.

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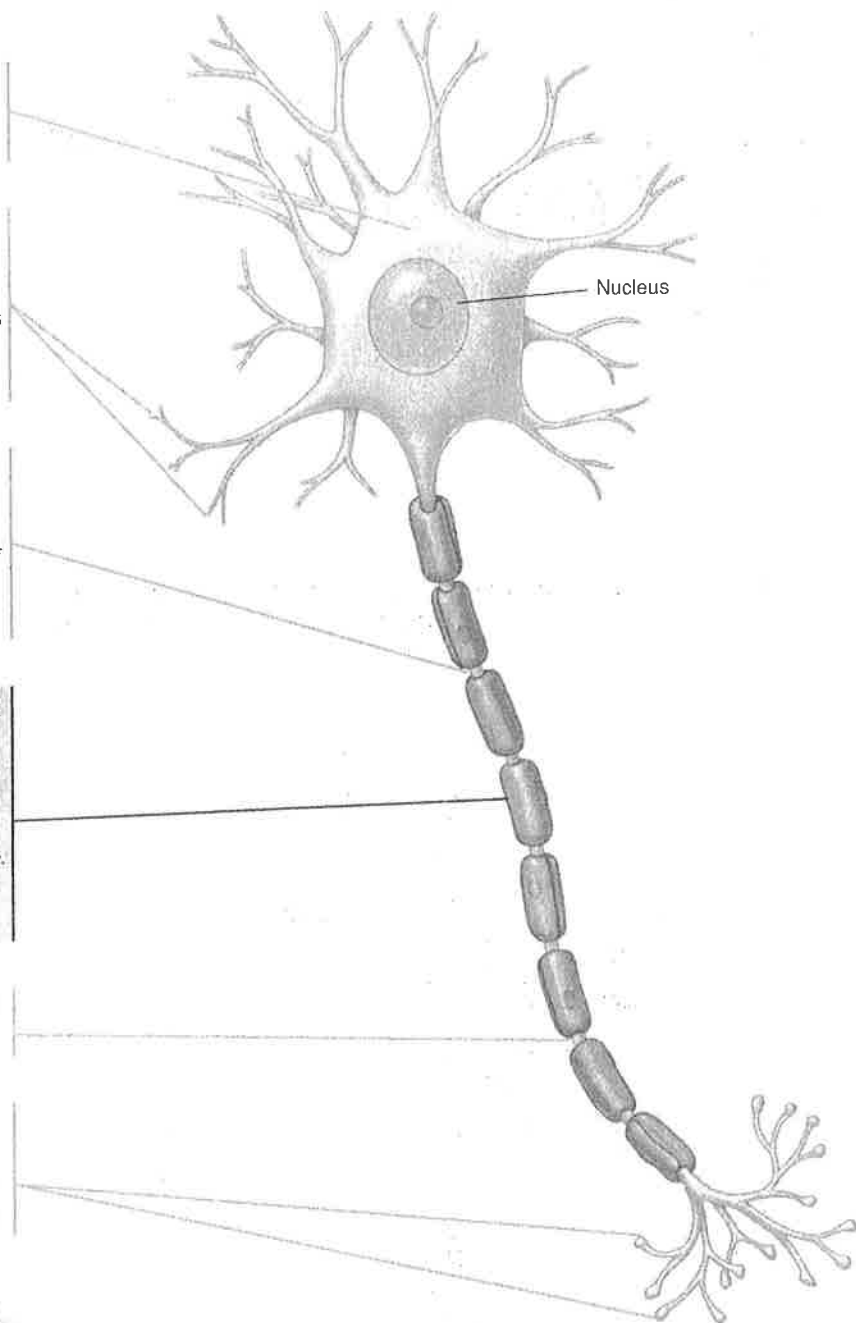
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# Station 6 - Neuron Puzzle

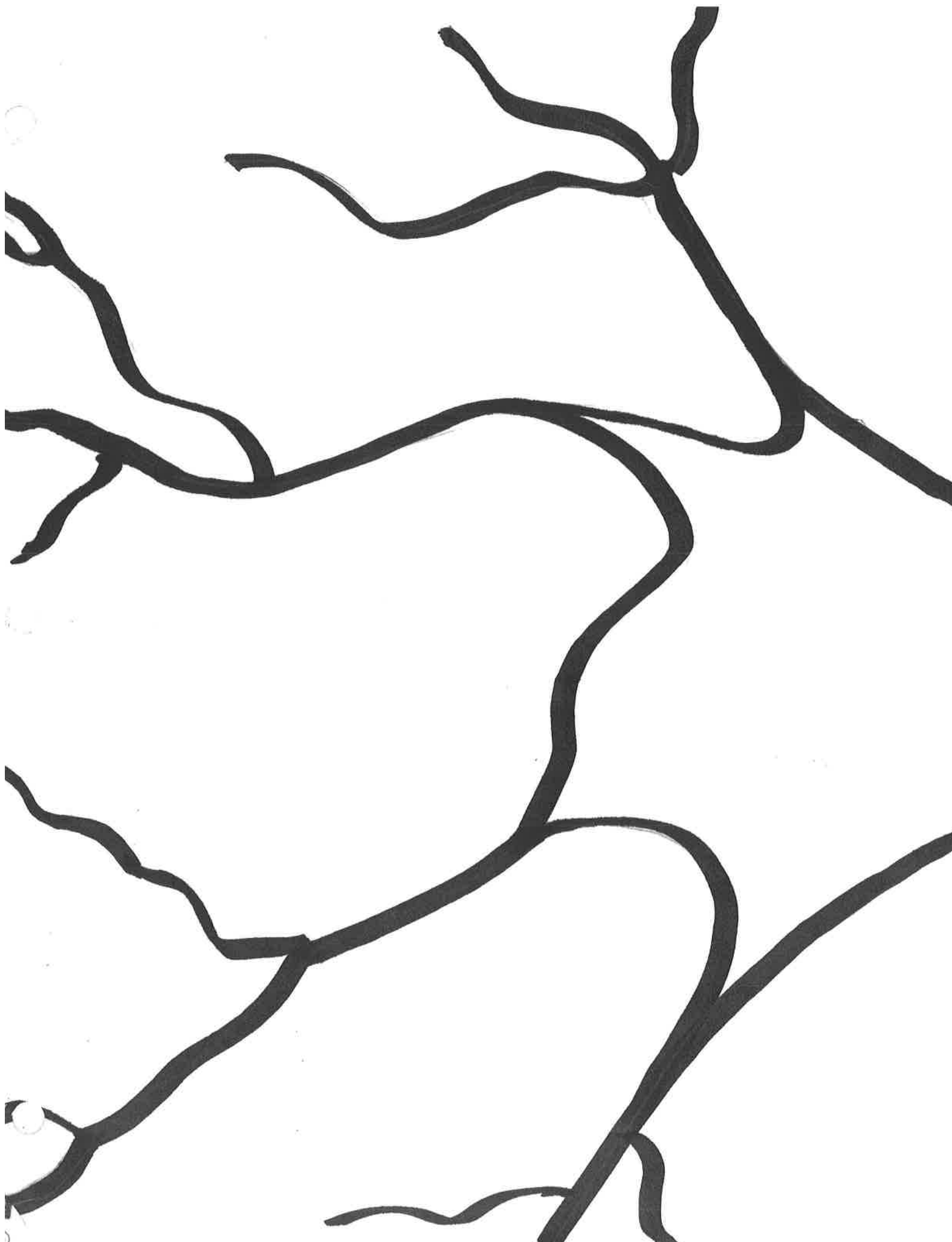
**1. Using the pieces provide, assemble your group's neuron.**

- There is only one correct answer...
- When you think you have it, have Ms. Steffen check it off before you tape it together

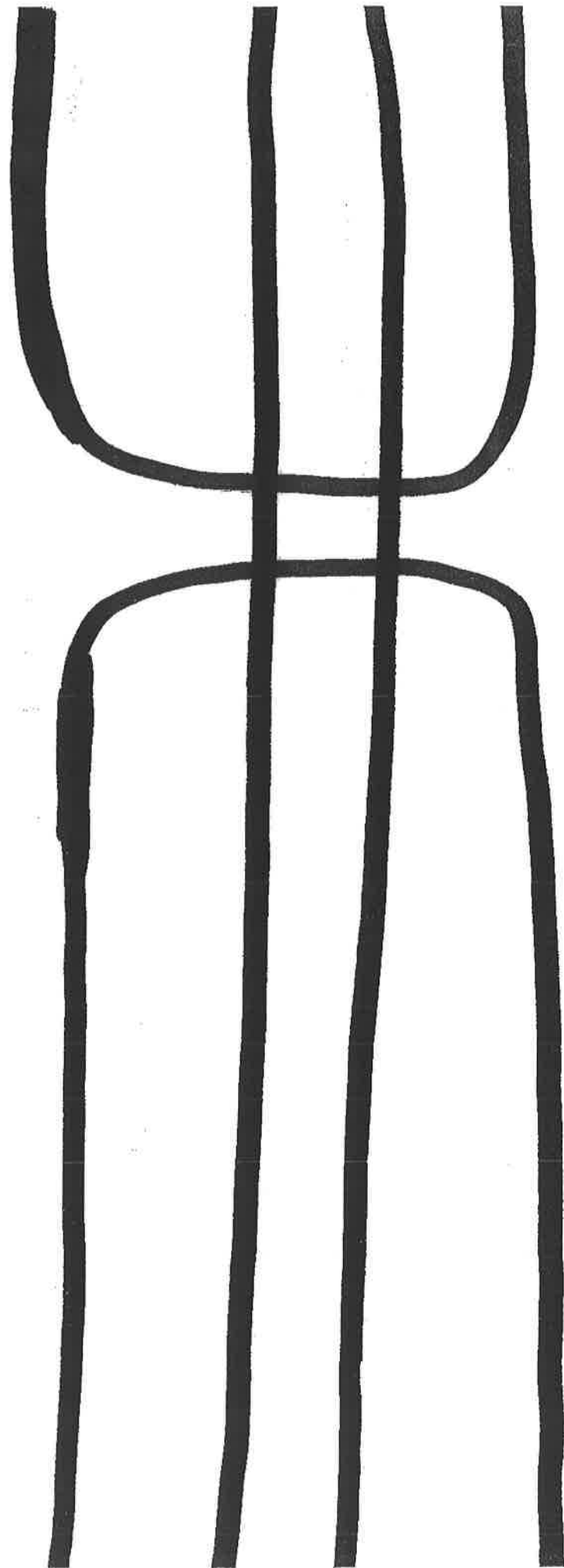
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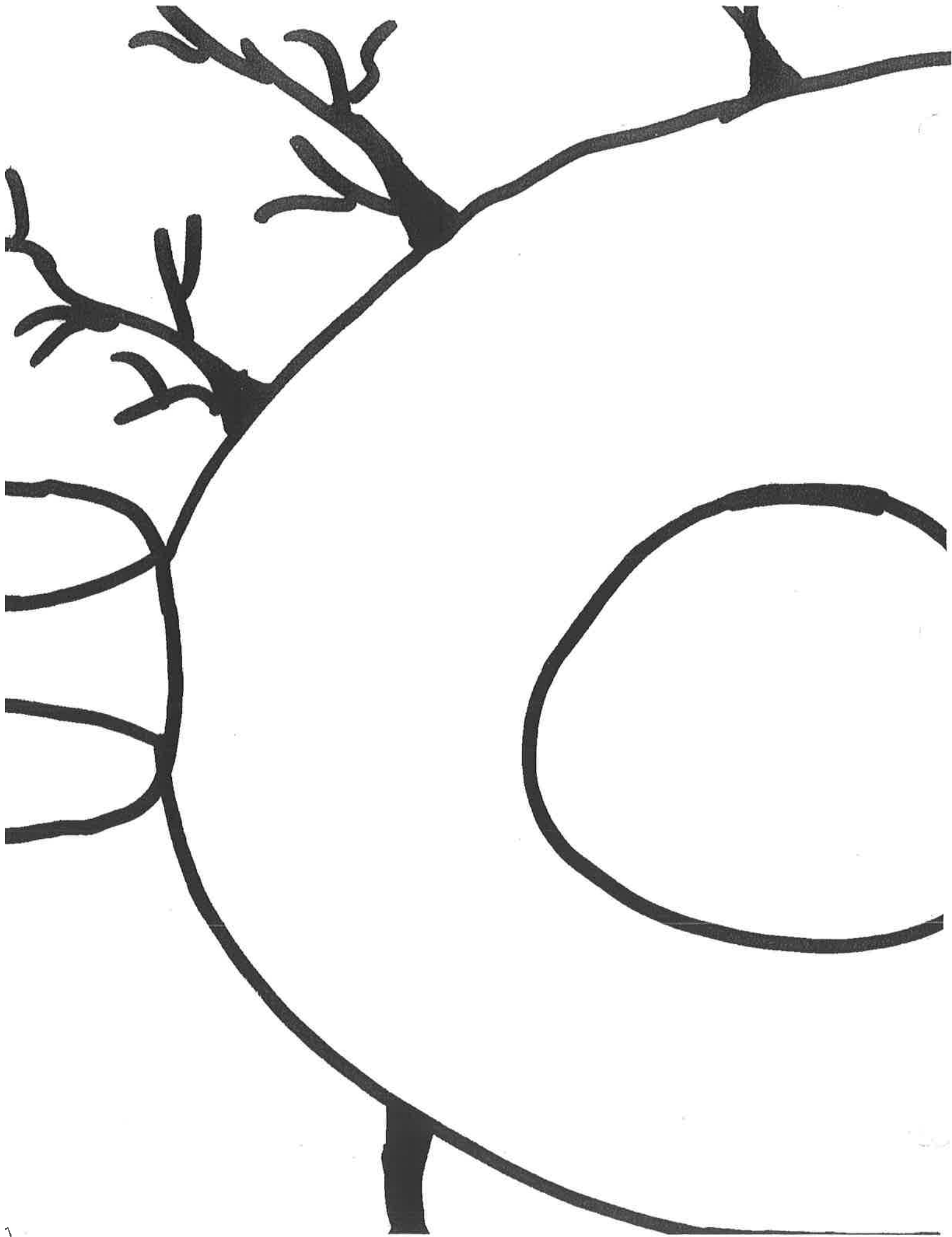
2. Once your neuron is assembled, label and color the following:

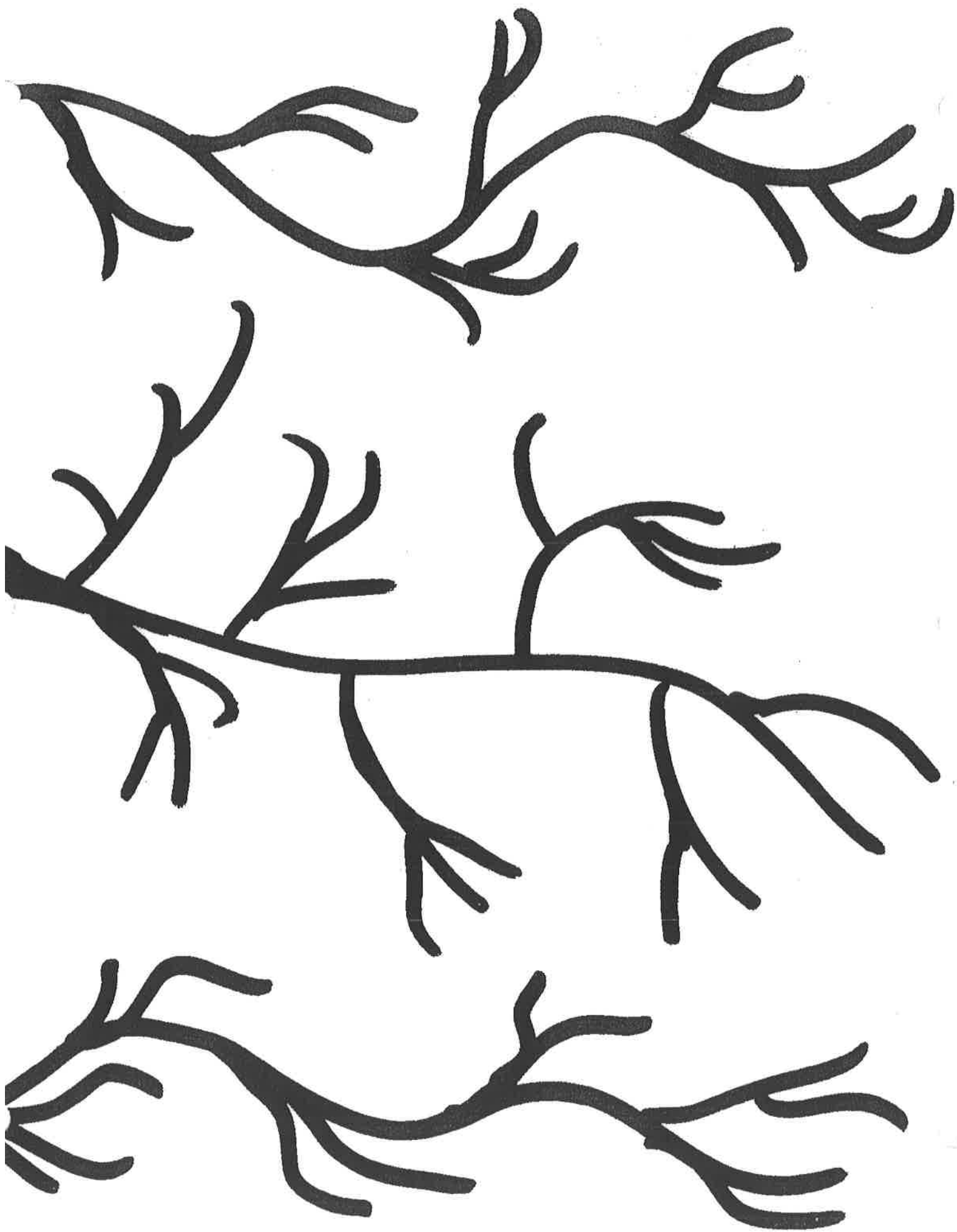
- Cell Body – Yellow
- Nucleus – Orange
- Dendrite – Green
- Axon – Red
- Myelin Sheath – Blue
- Nodes of Ranvier – Just label











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