

Topic 8: Body Systems – 8c. Nervous System

8c2. Neurology Lab

- Resources: Campbell et al. *Biology: Exploring Life*. Prentice Hall, Chapter 28.
- Campbell et al. *Biology: Concepts and Connections*, Pearson, Chapter 28.
- Miller and Levine. *Biology*. Prentice Hall, Chapter 35.
- Building on: Cell structure and function
Homeostasis
- Links to Chemistry: Chemical reactions
Thermochemistry
Chemistry of neurotransmitters
- Links to Physics: Conservation of energy
Electricity
- Stories: Students are inherently interested in their bodies. Processes that may seem intuitive to us as teachers and scientists often go undiscovered as children fail to investigate the world around them, including their own bodies. Using themselves as a topic of study and collecting data from their own bodies is an automatic “hook” for my students!

Lab Instructions and Materials for the Teacher:

The lab setup and prep for this activity could not be any easier! All you will need are some forceps and access to hot and cold water and some beakers in which to hold it. I often will perform the blind spot activity with the students—demonstrating where I can no longer see the “O.” A small flashlight can be helpful for the pupillary reflex section, but it is not necessary. For the touch and spatial discrimination section, I have the students mix in some trials in which the forceps are together (more than once). I then explain to the students that humans are difficult to experiment on because we like to be “right” and we will guess in order to be so. So they should mix up the trials as they go through each body part (for example, touch the upper arm at: 4 mm, 12 mm, 0 mm, 8 mm, 0 mm, 18 mm, 2 mm) and record the results. Do not go straight down the column for 0 mm to 18 mm apart!

Neurology Activity

The nervous system is an extremely important system of the body. It allows us to move, detect pain, react to certain situations very quickly with our “reflexes,” to sense the world around us, and most importantly, to think and reason. It is our highly developed nervous system that has allowed humans to occupy their unique place in nature, as the only animals with high-level reasoning. The workings of the nervous system (especially the brain) are only beginning to be understood. In this lab, we will attempt to explore some of the ways in which the nervous system works.

1. **Blind Spot** – With your right hand, hold the page provided 24 inches in front of your eyes. Cover your left eye with your left hand. Hold your gaze upon the “X.” (It is very important that you do not let your eyes wander!!) Slowly bring the page closer to your eye. Continue to look at the “X.” Eventually the “O” should disappear!

Attempt to explain this phenomenon.

2. **Pupillary Reflex** – Have your lab partner close their eyes for two minutes. At the end of two minutes, have them open their eyes. Watch the diameter of their pupils (the black part of the eye) as they do so. (You must watch immediately after they open their eyes!)

Describe what happens.

Why did this occur?

3. **Knee Jerk Reflex** – Have your partner sit on the end of a lab table with their legs dangling over the edge. (You may wish to have them cross their legs by placing one knee on top of the other.) With the edge of your hand, sharply strike the knee just below the patella. Try this several times.

Is there any response?

Attempt to explain this phenomenon.

4. **Touch and Spatial Discrimination** – Gently touch your partner with a pair of forceps, spread apart as in the column labeled “Space.” Mix up your intervals so that your partner cannot anticipate the results and do not let them look when you are touching them with the forceps.

Number of Pins Felt (1 or 2?)

# of Pins	Space	Forearm	Fingertip	Neck	Cheek	Upper Arm
1	0 mm					
2	2 mm					
2	4 mm					
2	8 mm					
2	12 mm					
2	18 mm					

Which areas of the body are the most sensitive?

List the above from the most sensitive to the least sensitive.
 Most sensitive → Medium sensitivity → Least sensitive

When you can no longer tell two points apart on the forceps, you are only stimulating a single nerve cell. This data can tell you the distance the nerve endings in the skin are spaced apart. In the least sensitive areas of the body, how far apart are the nerve endings spaced?

5. **Pain** – Pain is a most important sense. It is found in all areas of our bodies, but in the brain the nerve endings are set deeper in the skin than other senses.

What is the function or importance of pain in our bodies?

How would you explain why some pain is stronger than other pain? What function would this serve?

6. **Hot and Cold** – In addition to touch and pain, your skin can also detect differences in temperature. Remember, all nerve cells are designed to detect “differences” in the environment. To prove this, do the following experiment:

Get three small beakers. Fill one with room temperature water from a tank. Into a second beaker put some cold water (let the water run from the tap for a while); into the third beaker put hot water (don't burn yourself). Place your index finger from your left hand into the cold water and your index finger from your right hand into the hot water. After one minute, place them both into the room temperature water.

Describe the feeling of the left index finger.

Describe the feeling of the right index finger.

If you placed both fingers into water that was the same temperature, why did they give you two different feelings?

What three senses are determined through the skin?

(Blind Spot Activity page)

X

O