Name _____

Date _____ Hour _____

1A–The Scientific Method

Materials: drawing compass or caliper, ruler

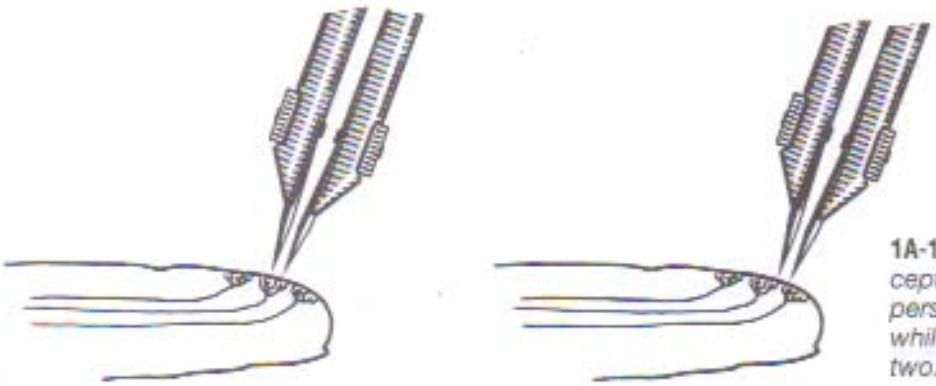
Goals:

To devise a problem that can be solved using the scientific method
To devise an experiment that will supply data to determine an answer to the problem
To collect and interpret data
To analyze and interpret data obtained
To learn the steps of the scientific method

While writing a report on the nervous system, Tom read this information in an encyclopedia:

> A nerve is stimulated by touching its endings. One nerve may branch to several nerve endings located in the same area of the skin. If two branches of the same nerve are touched at the same time, only one sensation is felt. The impulses may come from two nerve endings, but since they must travel along the same nerve to the brain, the brain senses only one point. If, however, the nerve endings of two different nerves are touched, the person feels two distinct sensations. This phenomenon, called two-point perception, is easy to demonstrate.

Tom started thinking as he studied the illustration (see Diagram 1A-1). He wondered if nerve endings covered an area of the same size in all the parts of the body. How much area did the nerve endings for each nerve cover? He called his brother and asked him to look at the other side of the room. Tom then took his compass and lightly touched his brother's arm with its two points, holding them in place. He asked his brother how many points he felt. He repeated the action, adjusting the distance between the points. He found that his brother sometimes felt only one point when the back of his hand was touched with the two points of the compass. Tom thought of several problems and experiments that he would like to try.



1A-1 *An illustration of two-point perception, using points of a caliper. The person on the left feels one point, while the person on the right feels two.*

*Preliminary Work

Your class will suggest experiments dealing with two-point perception, choose a problem, design and conduct an experiment to supply data that can be used to determine an answer to the problem, and arrive at a conclusion. For this experiment you may use only a drawing compass (or caliper) and a ruler. (Of course, you should also have a pencil, paper, and other classroom materials.) Before you

come to class, devise a few problems about two-point perception that you consider interesting and that the class could experiment with. Complete the material below before you come to class so that you can suggest a possible experiment.

I. List several problems dealing with two-point perception which could be used in class.
- Be sure your problems are worded as questions that have limitations and can be answered with yes, no, or a number.
- Avoid problems that might involve danger (e.g., placing compass points on the face) or those you would not be able to test (such as comparing red-haired people with blond-haired people when you have only one red-haired person in your class).
- List possible problems for the experiment.

II. Develop the problem you consider the best one by answering the following questions.
- What problem do you consider the best?
- What hypothesis would you suggest for this problem?
- Describe the steps of an experiment that will supply data either to support or contradict your hypothesis. (Attach additional paper if necessary.)
  - What is your experimental variable (single variable)?
  - List the precautions you would take to limit other variables.
  - What is serving as your control group?

Name _____

In-Class Procedures

At the beginning of the laboratory period, the class will choose a problem suggested by one of its members. As a group you will then devise an experiment and determine exactly how it will be conducted. The class will then divide into groups and conduct the experiment. Results of the experiment will be recorded on a chart and will be interpreted on the following day. As the class decides which problems to use and devises the experiment to conduct, record this information in the spaces below. (Use additional paper if necessary.)

I. Our problem is– _____

_____

II. Our hypothesis is– _____

_____

III. Our experiment involves– _____

_____

_____

- Our experimental variable is– _____

_____

- Steps taken to limit the variables include the following: _____

_____

_____

_____

_____

_____

_____

_____

- Our procedure for the experiment is as follows: _____

_____

_____

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_____

_____

_____

_____

- My observations of problems encountered while conducting the experiment include the following: _____

_____

_____

_____

_____

_____

_____

*Summary

The day following the experiment, the class will interpret the data obtained. After your in-class discussion, answer the following questions.

I. Regarding the data:

- Do the data tend to support the hypothesis? ☐ yes ☐ no
- What conclusions can be drawn from your data? _____

II. Personal observations:

- Were limitations to the problem and controls upon the experiment enough to supply reliable data? ☐ yes ☐ no
- What could you have done to improve the limitations and controls? _____
- Can you think of any additional changes that need to be made? _____
- Was the experiment repeated often enough to give reliable data? ☐ yes ☐ no
  How often would be enough to give reliable data? _____
- Based upon your experience, what other experiments dealing with two-point perception would you like to try? _____