Name _____ Date _____ Period _____

Lab: Möbius Strip

Background:

In 1858 the Möbius Strip or Möbius Band was discovered by and named after August Ferdinand Möbius, a 19th century German mathematician and astronomer, who was a pioneer in the field of topology. Since their discovery, Möbius strips have been used in a number of applications that exploit their remarkable property: one-sidedness. This characteristic is the result of a closed loop with a half-twist.

List the Steps of the Scientific Method in the space below:

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____

Purpose:

The basis for all scientific investigations is a series of steps that allow scientists to conduct controlled experiments while collecting valid data to test a particular hypothesis. This activity will allow you to practice using the scientific method to hypothesize possible outcomes for a simple experiment.

Materials:

60 cm strip of receipt tape

Pencil

Tape

Scissors

Procedure:

1. Bring the ends of a strip of receipt tape (~60 cm long) together to form a circle.
2. Twist one end (by turning it over on top of the other end) and use a piece of scotch tape to hold the two ends together. Be sure the tape spans the entire width of the paper.
3. Your strip should have a half-twist when completed correctly.

4. Hypothesize what might happen if you use your pencil to draw a continuous line down the center of your Möbius strip (pretending the tape holding the ends together is not there). Record your hypothesis in the Data section for Experiment 1 (it has been started for you).
5. After you have written your hypothesis, use your pencil to draw a continuous line down the center of your Möbius strip. Keep going as far as you can, remember you CAN cross the tape holding the ends together.
6. Record your results and discuss whether your hypothesis was correct or incorrect based on the results of your experiment.

Experiment 1:

Hypothesis: "If I draw a line down the center of the Möbius strip without lifting my pencil, then

_____

_____"

Record your results: _____

_____

Do your results support or refute your hypothesis? Explain. _____

_____

_____

7. Hypothesize what the Möbius strip would look like if you were to cut along the line you drew in Step 5. Record your hypothesis in the Data section for Experiment 2.
8. After you have written your hypothesis, use your scissors to cut along the line you drew (down the center of your Möbius strip). Be careful to stay in the center of your strip and DO NOT CUT FROM THE SIDE. (Your teacher can demonstrate this for you.)
9. Record your results and discuss whether your hypothesis was correct or incorrect based on the results of your experiment.

Experiment 2:

Hypothesis: _____

_____

Record your results: _____

_____

Do your results support or refute your hypothesis? Explain. _____

_____

_____

10. Hypothesize what might happen if you cut your Möbius strip once more, down the middle of the strip. Record your hypothesis in the Data section for Experiment 3.
11. Once you have written your hypothesis, use your scissors to cut down the center of your Möbius strip. Be very careful to stay in the center of your strip and DO NOT cut from either side.
12. Record your results and discuss whether your hypothesis was correct or incorrect based on the results of your experiment.

Experiment 3:

Hypothesis: _____

_____

Record your results: _____

_____

Do your results support or refute your hypothesis? Explain. _____

_____

_____

Analysis:

1. Describe what makes a Möbius strip different than a strip of paper taped in a circle?_____

_____

_____

2. Why is it important to read carefully and follow directions when conducting ANY lab activity?

_____

_____

3. Compare your results to someone next to you. Was there anything different? Why? Give examples.

_____

_____

4. Did your results in Experiment 2 influence your hypothesis in Experiment 3? How?

_____

_____

5. Identify and discuss one “real-life” application for a Möbius strip? (Think industry / science / mechanical, etc.)_____

_____

Conclusion:

Discuss how scientific thinking can result in scientific bias. Example: How did previous knowledge of

Experiment 1 influence your hypothesis for Experiment 2 and 3? Why is it necessary to test a hypothesis many times?

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____