**Name:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ The Kinetics of Water Flow through a Burette**

GuidingQuestion**:** What is the order and rate constant for the process of water flowing through a burette?

Materials**:** Burette, beaker, water, timer.

Procedure**:**

1. Rinse a 50.00mL burette until the water drains from the burette in sheets and no drops of water are clinging inside the burette. (They cling to impurities in the burette.)
2. Fill the burette to the top with water.
3. Completely open the stopcock valve and allow the water to drain from the burette.
4. Start the timer as the water passes the 0.00mL line.
5. Stop the timer when the water passes the 5.00mL line.
6. Refill the burette to the top. Repeat the procedure at 5.00mL intervals through the 30.00mL line.
7. Repeat the experiment for a second trial.
8. Perform the calculations necessary to complete the table.

Data

| Volume (mL) | Time 1 | Time 2 | Average Time | Volume remaining (Vr) | Ln (Vr) | 1/(Vr) |
| --- | --- | --- | --- | --- | --- | --- |
| 5.0 |  |  |  |  |  |  |
| 10.0 |  |  |  |  |  |  |
| 15.0 |  |  |  |  |  |  |
| 20.0 |  |  |  |  |  |  |
| 25.0 |  |  |  |  |  |  |
| 30.0 |  |  |  |  |  |  |

Calculations**:** Construct graphs of the following in your calculator and record your slope and regression values.

|  | Slope | Regression Value |
| --- | --- | --- |
| Average time versus Vr. |  |  |
| Average time versus ln(Vr). |  |  |
| Average time versus 1/(Vr). |  |  |



Questions**:**

1. After observing the graphs, what is the reactant order for the water flow?
2. What is the rate constant (with units) of the water flow based on your most linear graph?
3. Write the rate law based on your most linear graph.
4. Calculate the rate for each volume out value by dividing the volume delivered by the average time. [example: 5.0 mL/5.6 sec = .89 mL/sec].

| volume out | 5 | 10 | 15 | 20 | 25 | 30 |
| --- | --- | --- | --- | --- | --- | --- |
| Rate |  |  |  |  |  |  |

1. What does your result in question 4 tell you about the order of reaction?
2. Determine the value of the rate constant based on your answer to question 4. (Average your rates in question 4.) Specify the units on the rate constant.
3. How does the slope of the most linear graph compare to the one you obtained in question #6? Is it close to your most linear graph or is it closer to a different graph? Explain.

**Claim:** What is the order and rate constant for the process of water flowing through a burette?

**Evidence:** Identify and explain relevant data that supports your claim (how did you select your order and k?).

**Reasoning**: Explain how you interpreted your data (are you more sure of your graphed answer, your calculated answer, or do they say the same rate order and k?).

