**Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ AP Reaction Rate of Food Dye Fading Lab**

**Purpose**:Determine the order of the reaction when blue food dye fades.

**Materials**: Graduated Cylinder, Beaker/cup, Red Paper, Balance, 1.00M Sodium Carbonate, Blue1 dye 1 (7 µm), 3.00% Hydrogen Peroxide, Phone with color meter app.

**Background Information**: Blue food dye fades as it reacts with hydrogen peroxide solution, H2O2 in the presence of some basic sodium carbonate, Na2CO3. The reaction is run with a very large excess of H2O2, therefore the concentration of H2O2 essentially remains constant throughout the reaction. We will determine the order of the dye with respect to the time elapsed as it fades.

Rate = K [H2O2][dye]x

**Pre-Lab Questions:**

1. Why is red paper used to create the spectrophotometer?
2. Explain the graphs you would create to the determine the order of dye with respect to the time elapsed during the fading reaction:
   1. Zero order
   2. First Order
   3. Second order

**Procedure:**

1. Recreate the beer's law spec set up from the previous lab with red paper in the background (have a color app on the phone). You may choose to set up your phone over the cup using a ring stand.
2. Measure 100.00mL of water in a cylinder and place it in a cup.
3. Measure 10.00mL of 1.00M sodium carbonate solution in a cylinder.
4. Add the sodium carbonate solution to the cup and rinse out the graduated cylinder.
5. Measure 10.00mL of 3.00% Hydrogen peroxide in a graduated cylinder.
6. Add the 3.00% hydrogen peroxide into the cup, and rinse out the graduated cylinder.
7. Measure the blank l0 value (red value) with the red paper behind the clear solution.
8. Make sure your phone is set so it is measuring the red color of the paper THROUGH the blue dye solution. Record the initial l0 value for RED in the data section below (before the table).
9. Get your color app on the phone ready, and then start the timer while adding one drop of the Blue 1 Dye into the beaker.
10. Record the l value (RED value) every 15 seconds until it stops significantly changing. Stir occasionally.

**Data:**  Solution Before Rxn (I0) = \_\_\_\_\_\_\_

| Time (seconds) | **l** Values Trial | Absorbance (A) | lnA | A-1 |
| --- | --- | --- | --- | --- |
| 15 |  |  |  |  |
| 30 |  |  |  |  |
| 45 |  |  |  |  |
| 60 |  |  |  |  |
| 75 |  |  |  |  |
| 90 |  |  |  |  |
| 105 |  |  |  |  |
| 120 |  |  |  |  |
| 135 |  |  |  |  |
| 150 |  |  |  |  |
| 165 |  |  |  |  |
| 180 |  |  |  |  |
| 195 |  |  |  |  |
| 210 |  |  |  |  |
| 225 |  |  |  |  |
| 240 |  |  |  |  |
| 255 |  |  |  |  |
| 270 |  |  |  |  |
| 285 |  |  |  |  |
| 300 |  |  |  |  |
| 315 |  |  |  |  |
| 330 |  |  |  |  |
| 345 |  |  |  |  |
| 360 |  |  |  |  |

**Calculations:** Show ONE example calculation of how you took the R values and turned them into absorbance values. Then complete the rest of the table. *Absorbance = - log (l / l0 )*

**Data Analysis:** Upload images of your graphs of the following including slope and regression values.

* Abs vs time
* ln Abs vs time
* 1/Abs vs time

**Post lab Questions:**

1. Determine the order of the reaction when Blue food dye fades.

**Claim**: Write the Rate Law with the order of dye.

**Evidence**: Cite relevant data and calculations (discuss graphs).

**Reasoning**:Provide scientific explanation about how you determined the order by explaining how and why we performed our procedure.

1. What is the value of the rate constant, k, of this reaction. Report your answer with correct units and explain how you obtained your value.
2. If this lab was performed at a higher temperature, how would that affect the rate of the food dye fading?
3. How would the hotter temperature alter the rate constant, k?
4. How would you amend this experiment if you were testing the rate of red food dye fading?