Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Unit 4 Topic 1

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**Analyzing an Experiment about Photosynthesis**

**Directions:** For this assignment, you will read about a photosynthesis experiment and identify aspects of the experiment. You will also graph and analyze sample data.

**The Experiment:**

1. One snowy day in December, Mrs. Jensen decides that she’s going to do some cool science. She takes 40 Elodea sprigs and puts them each in a test tube full of water. (Elodea is an aquatic plant, and a “sprig” is like a branch.)
2. Mrs. Jensen knows that as the Elodea sprigs undergo photosynthesis, they will produce bubbles of oxygen gas. She decides to test the effect of light intensity on the rate of photosynthesis. She decides to change the light intensity by placing a lamp at different distances from her Elodea sprigs.



1. She puts 10 Elodea sprigs next to a lamp that is 10 cm away. She calls this group of plants “Group A.”
2. She puts 10 more Elodea sprigs next to a lamp that is 20 cm away. She calls this group of plants “Group B.”
3. She puts 10 more Elodea sprigs next to a lamp that is 30 cm away. She calls this group of plants “Group C.”
4. For her remaining 10 plants, she does not use a lamp at all. She calls this group of plants “Group D.”
5. Each Elodea sprig is the same size and has the same number of leaves. The test tubes are all the same size and contain the same amount of water. The normal overhead classroom lights are on for all of the trials.
6. Every minute for 5 minutes, she records the total number of oxygen bubbles in each test tube. The data she collected is given in the chart below. (Note: She found the average total number of bubbles in the test tubes of the 10 plants from each group.)

|  |  |
| --- | --- |
|  | **Total Number of Bubbles in the Test Tube** |
| **Time** | **Group A** | **Group B** | **Group C** | **Group D** |
| 1 | 10 | 8 | 6 | 3 |
| 2 | 18 | 15 | 11 | 7 |
| 3 | 29 | 21 | 16 | 10 |
| 4 | 38 | 29 | 22 | 15 |
| 5 | 50 | 36 | 27 | 19 |

**Part I: Breaking down the Experiment –** Now, you will use the information given above to identify key aspects of the experiment like the independent variable, dependent variable, etc. Use the information given below to help you remember the definitions of these key experimental aspects.

**Hypothesis:** “If [I do this], then [this will happen].”

*Ex: “If I water the grass, then it will grow.”*

**Independent Variable:** The thing you are changing (i.e. the cause).

*Ex: The water*

**Dependent Variable:** The thing you are measuring (i.e. the effect).

*Ex. The height of the grass*

**Experimental Group:** The group of test subjects that receive the independent variable.

*Ex: The patch of grass that gets watered.*

**Control Group:** The group of test subjects that DO NOT receive the independent variable. The results from this group are compared to the results from the experimental group to make sure that the changes in the dependent variable *(ex: grass height)* are truly a result of the independent variable *(ex: the water).*

*Ex: The patch of grass that does not get watered.*

**Constants:** Things that are kept the same between your experimental group and the control group to ensure that only the independent variable is being tested.

*Ex: sunlight, amount of fertilizer, type of grass*

1. Write a possible hypothesis for Mrs. Jensen’s experiment. Please use “If, then” format.
2. What is the independent variable in Mrs. Jensen’s experiment? What are the “levels” of the independent variable in her experiment.
3. What is the dependent variable in Mrs. Jensen’s experiment? How does she measure changes in this variable?
4. What is her control group?
5. What are her experimental groups?
6. Why is it important to use multiple plants (10) in each group?
7. What are some constants in her experiment?

**Part B: Graphing the Data –** Graph the data collected by Mrs. Jensen in the grid given below.

1. What type of graph will you use (bar or line) and why?
2. What should you include in your graph (ex: a title)?



**Part C: Analyzing the Data –** Answer the following questions about the results of Mrs. Jensen’s experiment.

1. Calculate the rate of oxygen bubble production over the 5 minutes for each group of plants. Rate is calculated by dividing the change in one variable (the number of bubbles) by the change in time (5 minutes).

For example, if a plant produced 55 bubbles over a five minute time period, you could determine the rate of bubble production using the following calculation.

|  |  |  |  |
| --- | --- | --- | --- |
| **Change in Number of Bubbles** | **Change in Time** | **Calculation** | **Rate of Bubble Production** |
| 55 total bubbles | 5 minutes | 55 / 5 | 11 bubbles produced per minute |

Use the following data chart to help you organize your data and calculations. Round your rate to the nearest tenth of a bubble.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Group**  | **Change in Number of Bubbles** | **Change in Time** | **Calculation** | **Rate of Bubble Production** |
| A |  |  |  |  |
| B |  |  |  |  |
| C |  |  |  |  |
| D |  |  |  |  |

1. Does the data support the hypothesis you wrote for Question #1? Explain your answer by comparing the rates you calculated for Question #10.