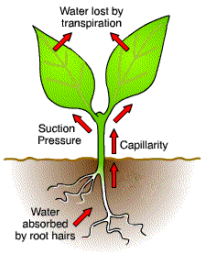
Name: _____ Period: _____

A Plant's Raw Materials



1. What is photosynthesis?

2. What do plants need to perform photosynthesis?
   -
   -
   -

Experiment: A plant was placed in an apparatus in which the amount of water, the amount of light, and the amount of carbon dioxide can be changed to see how many oxygen bubbles are produced. Three different experiments were conducted, changing one of these factors (water, light, carbon dioxide) each time.

3. What is the relationship between oxygen and photosynthesis?

4. What would a low number of oxygen bubbles indicate about photosynthesis?

5. What would a high number of oxygen bubbles indicate about photosynthesis?

6. Plot the data on the graph you have been assigned. ALL GRAPHS NEED TO BE DONE AND APPROVED BEFORE MOVING ON.

STOP: Get graph approved by the teacher. Initials from teacher _____

Group Conclusion Questions:

7. Fill out the data table below with the **range** of each factor that will produce the optimal number of oxygen bubbles.

Factor	**Range of each factor that produces the optimal number of bubbles**
Water	
Light	
CO_2	
Temperature	

8. What **trend** (overall pattern) do you see in the ranges to produce optimal number of bubbles for all 4 factors?

   _____

   _____

9. Using **Data Set 3,** fill out the data table below with the range of each factor that will produce the optimal amount of sugar.

Factor	Range of each factor that produces the optimal amount of sugar
Water	
Light	
CO_2	
Temperature	

10. What **trend** (overall pattern) do you see in the ranges to produce the optimal amount of sugar for all 4 factors?

_____

_____

11. Comparing your answers from #4 and #5, is oxygen a reliable predictor of photosynthetic activity? **Use data from the graph to support your answer.**

_____

_____

_____

12. Based on the data you observed, write an equation to show the reactants (inputs) and products (outputs) of photosynthesis.

13. Plants use photosynthesis to make sugar. Why do plants need sugar?

_____

_____

14. Think back to the elephant and lion digestion lab. How will the plant transform sugar into a needed substance such as protein?

_____

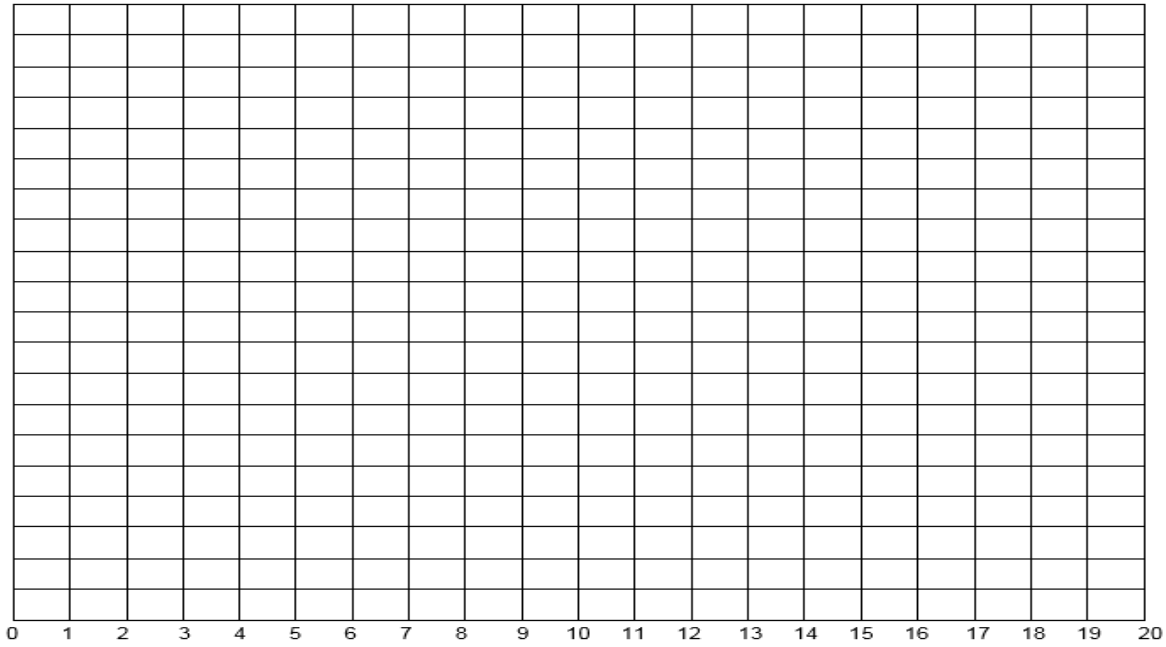
_____

_____

A Plant's Raw Materials Name: _____

Graph the data provided to determine the response to the variable. You may replace the grid below with your own graph. Label both the X and Y axis.

Number of Oxygen bubbles vs. Amount of Water



Amount of water (mL)	Number of oxygen bubbles
0	0
1	2
2	5
3	6
4	6
5	7
6	7
7	7
8	8
9	10
10	12

Conclusion Questions:

1. What **trend** is seen between 0-10mL? Use data to support your answer. _____

   _____

2. If the experiment continued from 11-15mL with increasing amounts of water, **predict** what would happen to the number of oxygen bubbles. _____

   _____

Get **Data Table 2**. Add this data to your graph using a different color.

3. What **trend** is seen between 11-15mL? Use data to support your answer. _____

   _____

4. If the experiment continued from 16-20mL of water, **predict** what would happen to the number of oxygen bubbles. _____

   _____

5. **Predict** the number of oxygen bubbles if the amount of water is

   a. 18 mL (plot this on your graph) _____. Explain. _____

      _____

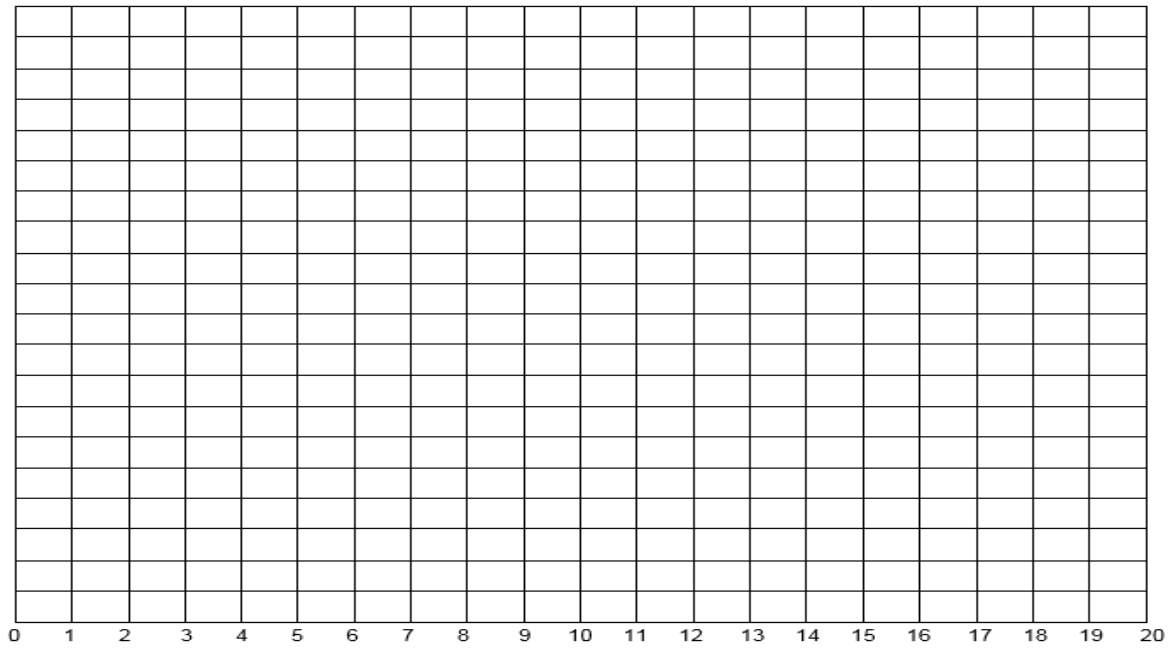
   b. 20 mL (plot this on your graph) _____. Explain. _____

      _____

A Plant's Raw Materials Name: _____

Graph the data provided to determine the response to the variable. You may replace the grid below with your own graph. Label both the X and Y axis.

Number of Oxygen bubbles vs. Amount of Light



Amount of light (watt)	Number of oxygen bubbles
0	0
1	3
2	3
3	7
4	7
5	8
6	9
7	9
8	12
9	13
10	15

Conclusion Questions:

1. What **trend** is seen between 0-10 watts? Use data to support your answer. _____

   _____

2. If the experiment continued from 11-15 watts with increasing amounts of light, **predict** what would happen to the number of oxygen bubbles. _____

   _____

Get **Data Table 2**. Add this data to your graph using a different color.

3. What **trend** is seen between 11-15 watts? Use data to support your answer. _____

   _____

4. If the experiment continued from 16-20 watts with increasing amounts of light, **predict** what would happen to the number of oxygen bubbles. _____

   _____

5. **Predict** the number of oxygen bubbles if the amount of light is

   a. 17 watts (plot this on your graph) _____. Explain. _____

      _____

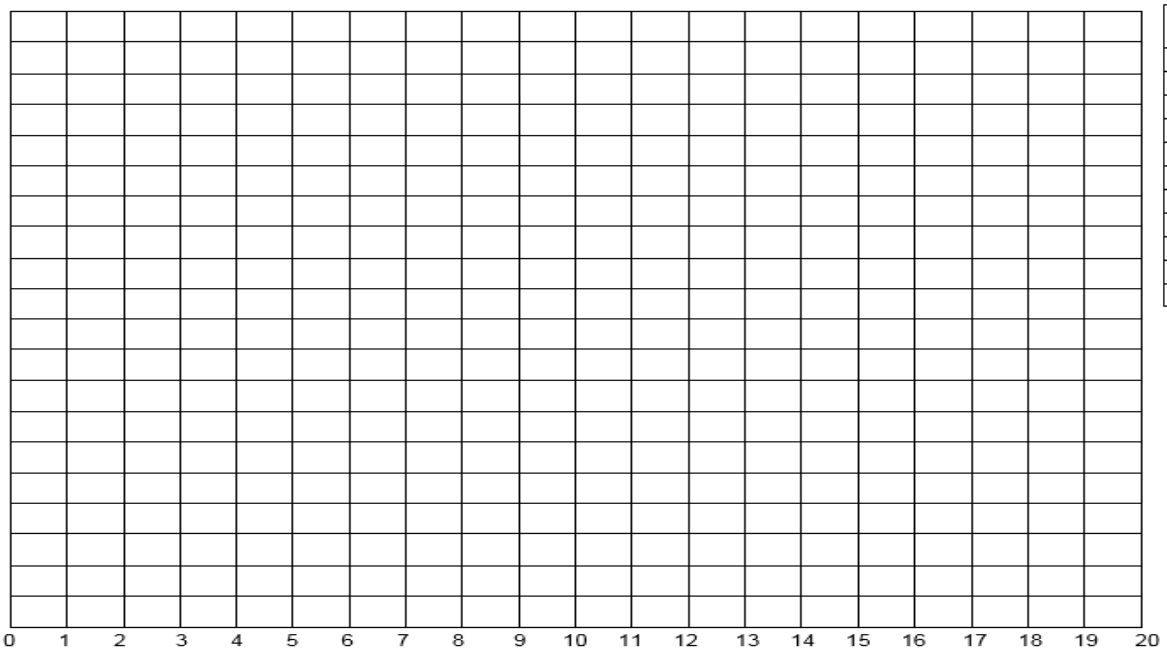
   b. 19 watts (plot this on your graph) _____. Explain. _____

      _____

A Plant's Raw Materials Name: _____

Graph the data provided to determine the response to the variable. You may replace the grid below with your own graph. Label both the X and Y axis.

Number of Oxygen bubbles vs. Amount of CO_2



Amount of CO_2 (ppm)	Number of oxygen bubbles
0	0
1	5
2	6
3	6
4	8
5	8
6	10
7	10
8	13
9	15
10	17

Conclusion Questions:

1. What **trend** is seen between 0-10 ppm? Use data to support your answer. _____

   _____

2. If the experiment continued from 11-15 ppm with increasing amounts of CO_2, **predict** what would happen to the number of oxygen bubbles. _____

   _____

Get Data Table 2. Add this data to your graph using a different color.

3. What **trend** is seen between 11-15 ppm? Use data to support your answer. _____

   _____

4. If the experiment continued from 16-20 ppm with increasing amounts of CO_2, **predict** what would happen to the number of oxygen bubbles. _____

   _____

5. **Predict** the number of oxygen bubbles if the amount of CO_2 is

   a. 17 ppm (plot this on your graph) _____. Explain. _____

      _____

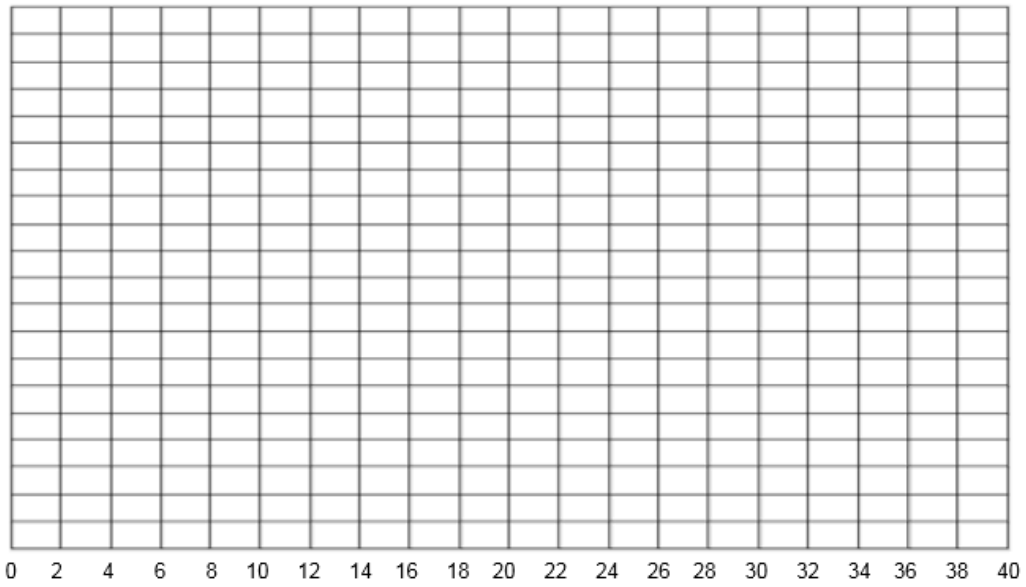
   b. 20 ppm (plot this on your graph) _____. Explain. _____

      _____

A Plant's Raw Materials Name: _____

Graph the data provided to determine the response to the variable. You may replace the grid below with your own graph. Label both the X and Y axis. ***Though it shows the highest temperature to be 20°C, note that your scale for your X-axis goes up to 40°C to be used later. Scale your Y-axis to 40 bubbles of oxygen.***

Number of Oxygen bubbles vs. Temperature



Temperature (°C)	Number of oxygen bubbles
0	0
2	2
4	3
6	4
8	5
10	7
12	12
14	16
16	21
18	27
20	30

Conclusion Questions:

1. What **trend** is seen between 0-20°C? Use data to support your answer. _____

   _____

2. If the experiment continued from 22-30°C with increasing temperature, **predict** what would happen to the number of oxygen bubbles. _____

   _____

Get **Data Table 2**. Add this data to your graph using a different color.

3. What **trend** is seen between 22-30°C? Use data to support your answer. _____

   _____

4. If the experiment continued from 32-40°C, **predict** what would happen to the number of oxygen bubbles. _____

   _____

5. **Predict** the number of oxygen bubbles if the temperature is

   a. 38°C (plot this on your graph) _____. Explain. _____

      _____

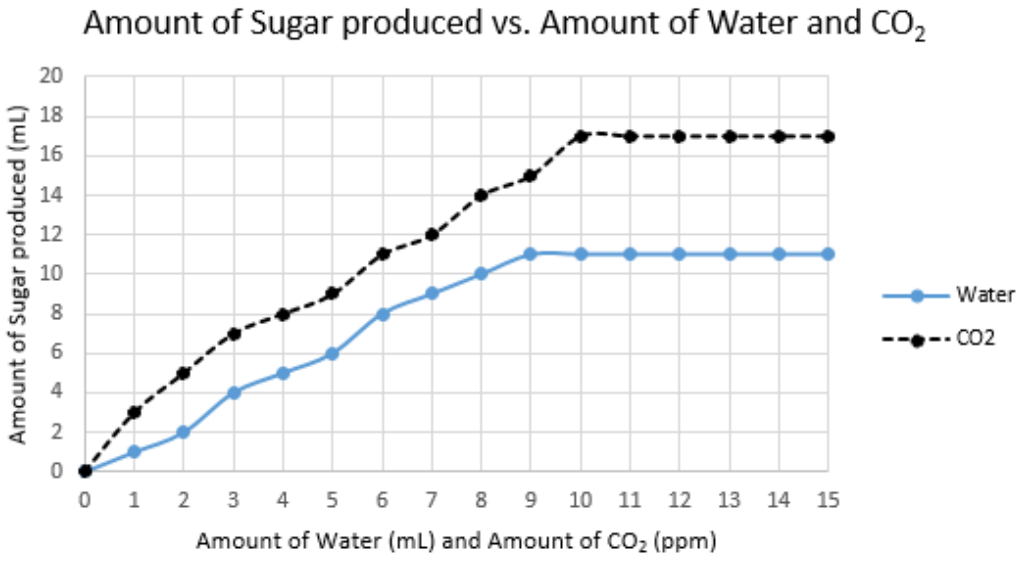
   b. 40°C (plot this on your graph) _____. Explain. _____

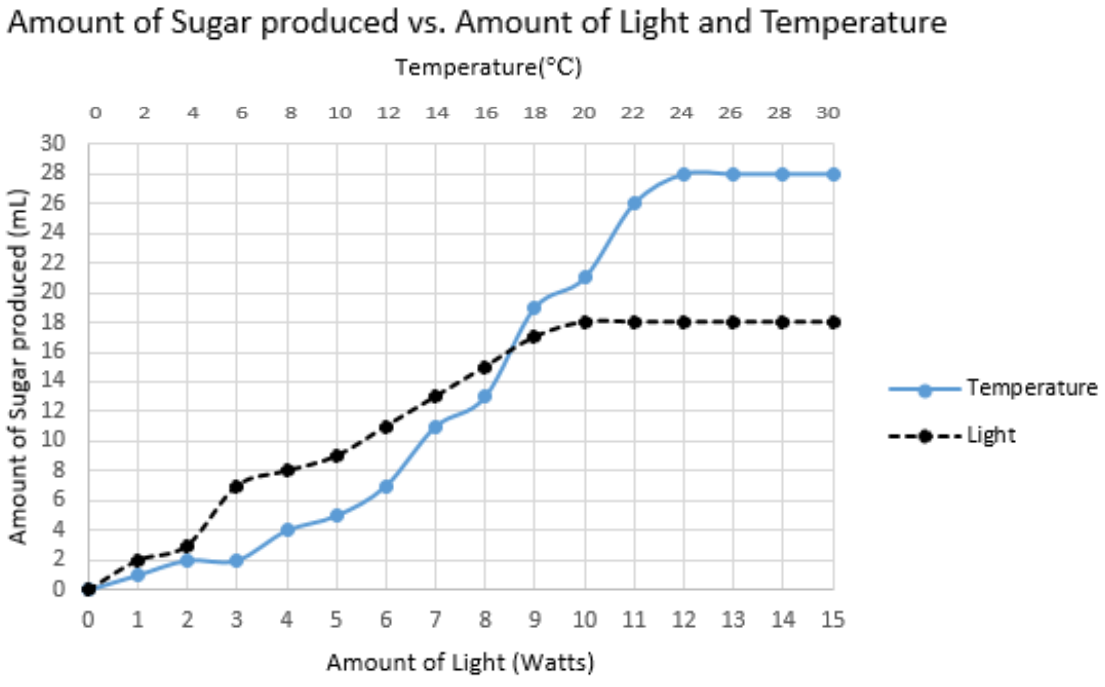
      _____

Data Table 2

Amt of water (mL)	# of O_2 bubbles		Amt of light (watt)	# of O_2 bubbles		Amt of CO_2 (ppm)	# of O_2 bubbles		Temp (°C)	# of O_2 bubbles
11	12		11	15		11	17		22	35
12	12		12	16		12	16		24	36
13	13		13	16		13	17		26	37
14	12		14	16		14	16		28	37
15	12		15	16		15	17		30	37

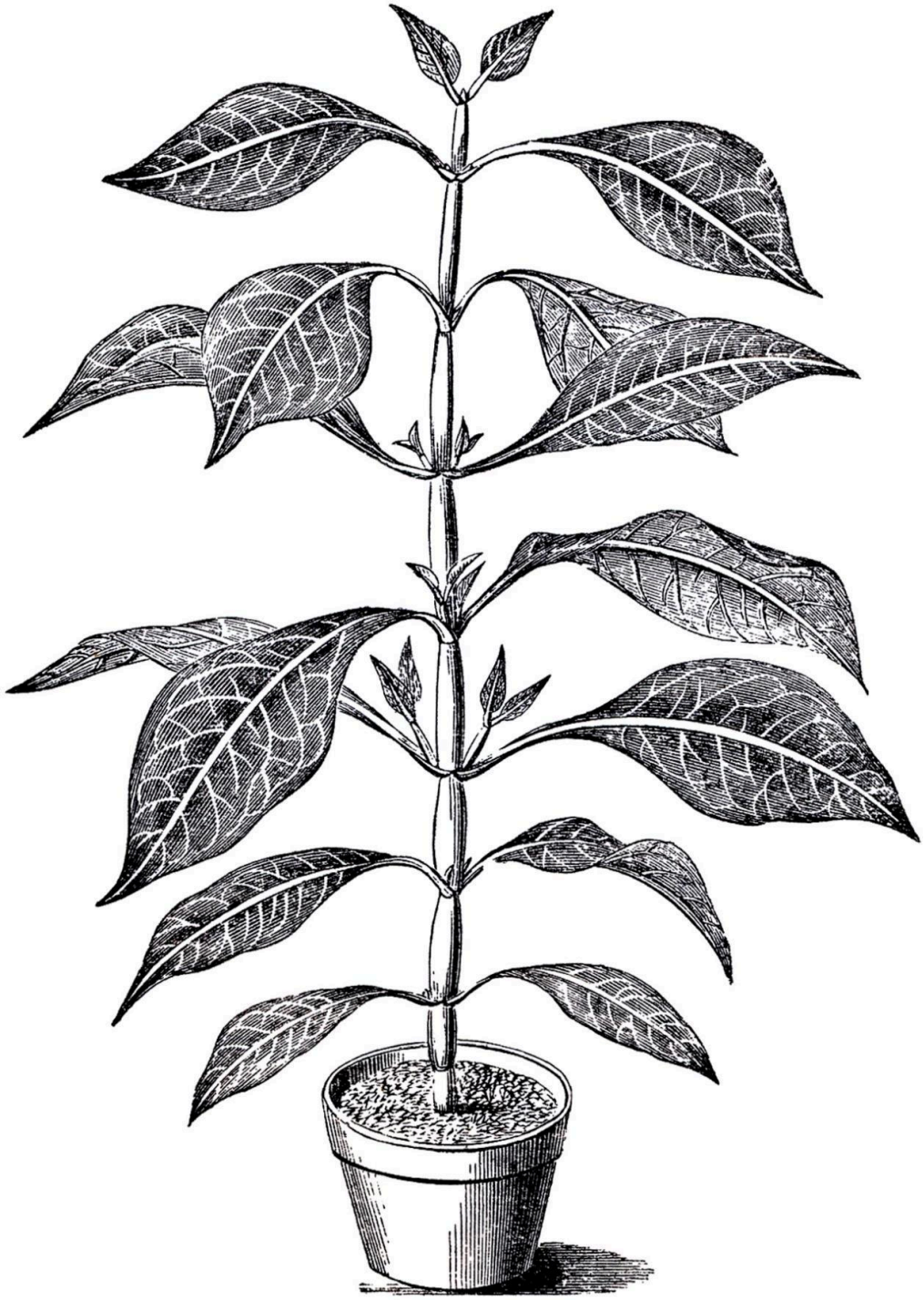
Data Set 3





Modeling Photosynthesis Name: _____

Use the model below to represent the process of photosynthesis, making sure to include the absorption of light energy and its conversion into chemical energy, as well as the roles of CO_2 and H_2O in the creation of glucose and released O_2.



Extension Experiment and Questions **Name: _____**

Tommy's Tomatoes

White light is composed of other colors/wavelengths of light. These wavelengths have different amounts of energy. A question that if often posed asks which wavelengths of light would make plants grow best. You set up the following experiment: 6 tomato plants of the same variety potted in the same kind of soil. Each plant received the same amount of water and fertilizer for 3 months. Five of the plants received light of only a certain color. One plant received natural daylight. The amount of time each plant was exposed to light was the same. Measurements of the height of each plant at the beginning of the experiment and at the end of 100 days is found below.

Plant	**Color of Light**	**Plant Height (cm) over 100 days**					Overall Growth (cm)
		Day 0	Day 25	Day 50	Day 75	Day 100	
Plant 1	daylight	10	14	19	22	29	
Plant 2	red	11	18	26	31	36	
Plant 3	blue	9	16	23	30	38	
Plant 4	yellow	12	14	17	19	22	
Plant 5	orange	10	13	17	20	24	
Plant 6	violet	11	17	23	29	35	

1. Graph the OVERALL GROWTH only for each color of light.

2. Based on the overall growth, under which color of light did the plant grow the most? Give data to support your answer.

   _____

   _____

3. If you were to redo the original experiment, what would you change in the experiment to increase the outputs of photosynthesis? Explain.

   _____

   _____