

MiSP Photosynthesis Worksheet #2 - Photosynthesis and Temperature

Name \_\_\_\_\_

Date \_\_\_\_\_

**Introduction:** Many things affect the rate (speed) at which photosynthesis occurs: how much light (light intensity), temperature, and amount of carbon dioxide are a few factors. Scientists know that temperature affects the speed of chemical reactions. Photosynthesis is a series of chemical reactions.

Scientists did an experiment on aspen trees to see how the rate of photosynthesis was affected by increasing temperature. They measured the speed of photosynthesis by measuring how much carbon dioxide was taken in to be used in photosynthesis.

**Problem:** What happens to the rate of photosynthesis as temperature is increased? The data in the table below were collected.

Temperature °C	Carbon dioxide used per second
10	8
15	12
20	16
25	20
30	24
35	28
40	21
45	14
50	7
55	0

Graph the data on the next page.

- The manipulated/independent variable is \_\_\_\_\_.
- Label the X axis
- The responding/dependent variable is \_\_\_\_\_.
- Label the Y axis
- Connect the data points with straight lines.

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A large grid of graph paper consisting of 20 columns and 25 rows of small squares, intended for recording experimental data.

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Discussion

1a. Complete this sentence: Between 10 and 35 °C the rate of photosynthesis

\_\_\_\_\_.

1b. Complete this sentence: Between 35 and 55 °C the rate of photosynthesis

\_\_\_\_\_.

2 . How does the rate of photosynthesis compare between 10 °C and 20 °C?

\_\_\_\_\_

3. Why doesn't the rate of photosynthesis keep increasing as the temperature increases? Hints - in humans a high temperature much above 37 °C (98.6 °F) can be fatal.

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

4. Use the graph to predict the rate of photosynthesis at the following temperatures:

- 17 °C \_\_\_\_\_
- 38 °C \_\_\_\_\_
- 60 °C \_\_\_\_\_

5. Use the information from the graph to calculate the unit rates of change for the carbon dioxide used. Use the formula to complete the chart on the next page.

$$\text{Unit Rate of Change} = \frac{\Delta y}{\Delta x} = \frac{(y_2 - y_1)}{(x_2 - x_1)} = \frac{\Delta \text{Carbon dioxide used per second}}{\Delta \text{Temperature}}$$

Graph segment Ordered Pairs ( $x_1, y_1$ ) ( $x_2, y_2$ )	$\Delta$ Carbon dioxide used per second $\Delta y$	$\Delta$ Temperature $\Delta x$	Unit Rate of Change $\Delta y/\Delta x$
10-35 °C			
35-55 °C			

6. Look at the two unit rates of change calculated in #5. What do those numbers tell us about those sections of the photosynthesis rate graph? How does your answer support your sentence completions in 1a and 1b?

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