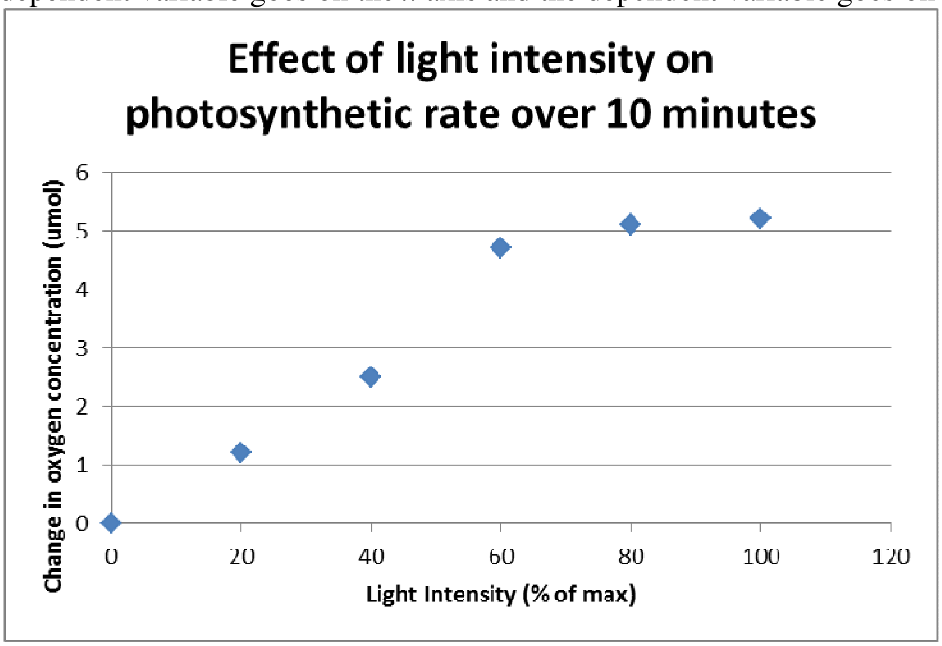
Name: Period: Date:

Topic 4: Critical Thinking

The data table below shows the experimental data from an experiment testing the effect of light intensity on the rate of photosynthesis. Calculate the photosynthetic rate (remember that a rate is a change per unit time) for each light intensity, and use this information to answer the questions below.

Light Intensity (% of max)	Change in Oxygen concentration (μmol O_2)	Time (min)	Photosynthetic rate (μmol O_2/min)
0	0	10	0
20	12	10	1.2
40	25	10	2.5
60	47	10	4.7
80	51	10	5.1
100	52	10	5.2

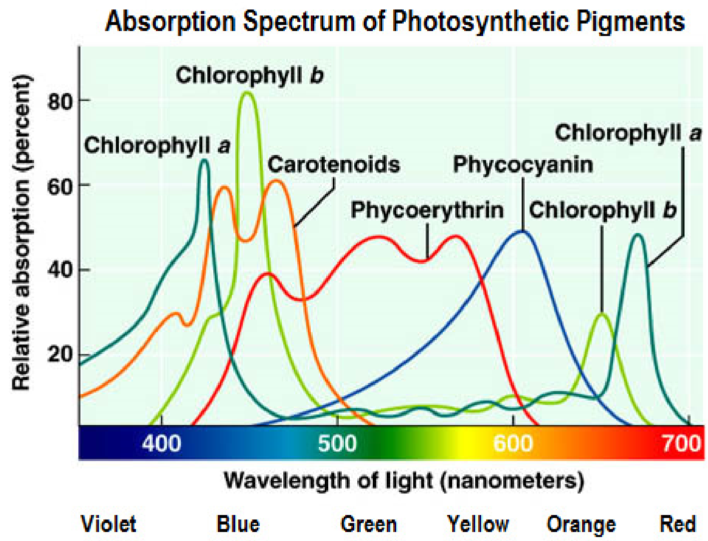
1. When you have calculated rates of photosynthesis at each light intensity, graph your data. Remember, independent variable goes on the *x* axis and the dependent variable goes on the *y* axis.



2. You have just produced a **photosynthetic light response curve**. The light intensity beyond which the light response curve levels off is called the light saturation point of photosynthesis. At this point increases in light intensity do not cause increases in photosynthetic rate, so other factors apart from the supply of light must be limiting the photosynthetic process.
   a. What might these factors be?
      CO_2 concentration, temperature
   b. Did you reach the light saturation point in your experiment? If not, why do you think the light saturation point was not reached?
      yes
   c. If the light saturation point was reached, what do you think was the major factor limiting photosynthesis at this point? Why? Probably CO_2 concentration since it is very likely that temperature was being help constant in this experiment
   d. How could you test this? Conduct same experiment but keep light intensity constant and blow CO_2 into test tubes for different amounts of time

3. A follow-up experiment is conducted to investigate how the wavelength (color) of light affect photosynthetic rate. The data are given in the table below:

Light Color	Change in Oxygen concentration (µmol O_2)	Time (min)	Photosynthetic rate (µmol O_2/min)
White	55	10	5.5
Red	1	10	0.1
Blue	9	10	0.9
Green	20	10	2.0
Yellow	46	10	4.6
Dark	0	10	0.0



a. Given these data, what is a reasonable conclusion that could be reached from this experiment?

Photosynthesis is occurring most efficiently under white (which is a combination of all colors) and specifically the yellow wavelengths.

b. If the experimental organism is a new species of protist that has yet to be described, what color would it appear (assume it gets its color only from the photosynthetic pigment inside)?
Red-blue (essentially violet) because it is reflecting those wavelengths (no photosynthesis)

c. Which photosynthetic pigment would this protist likely contain? phycocyanin

4. According to your understanding of cellular respiration, what could be happening when a marathon runner must revert to walking?
The body is running out of oxygen for aerobic respiration, so it must use anaerobic respiration to make ATP. Since this is less efficient, the runner does not have enough energy to keep running and must walk instead.

5. Anemia occurs when a person doesn't have enough iron in his or her blood. Iron is an important part of the molecule hemoglobin, which carries oxygen to the cells of the body. Would fatigue (tiredness) be a common symptom of anemia? Why or why not?
Yes, if the cells cannot get enough oxygen, they would be unable to perform aerobic cellular respiration and would not produce as much ATP.

6. A large amount of ATP in a cell inhibits the enzymes that catalyze the first few steps of glycolysis. How will this inhibition eventually affect the amount of ATP in the cell? Why is this actually a *good* thing for the cell?
It would eventually prevent the breakdown of glucose by glycolysis, which would prevent Krebs Cycle and ETC from happening. This would result in the cell saving resources by not producing excess ATP when it is not needed.