Name _____ Class _____ Date _____

Dissolved Oxygen and Respiration

Part 1: Experiment

Background: Plants make oxygen through the process of photosynthesis, and use oxygen through the process of respiration.

Photosynthesis: Carbon Dioxide and Water react with light to produce Glucose and Oxygen

$$6CO_2 + 6\,H_2O \xrightarrow[\text{light}]{} C_6H_{12}O_6 + 6\,O_2$$

Respiration: Glucose and Oxygen react to produce Carbon Dioxide, Water and Energy (in the form of ATP)

$$C_6H_{12}O_6 + 6O_2 \longrightarrow 6CO_2 + 6H_2O + \text{Energy}$$

In this lab, you are trying to find out what happens to the level of dissolved oxygen overnight, so that you can see the effects of respiration. Photosynthesis happens during the daytime (unless you're dealing with the C4 pathways). You will study this process in detail in another lab.

Before you begin:

Make a prediction: what will happen to the DO levels in the jar left in the dark for 24 hours? Will it go up or down from the initial reading? _____

What would happen if you added plants to your jar? How would this change the result?

_____

Create two tables: one that will show the results of your experiment, and one that will show the results of the class. Remember to make a control.

Procedure: You will develop your own procedure for this experiment. Write your steps carefully in your lab notebook for use in your lab report.

Discussion questions:

1. What changed more, the control or the experimental jar? Why do you think this happened?
2. When do you think plants use the most dissolved oxygen?
3. Do you think animals respond the same way as plants? Why or why not?
4. What time of day do you think is most difficult for aquatic organisms? Why?
5. Based on what you know about the relationship between temperature and dissolved oxygen, and now respiration and dissolved oxygen, what time of year do you think is the most stressful for aquatic plants and animals? Why?

Modified with permission from: "Plants use oxygen?" 1997. Living in Water, National Aquarium in Baltimore, Kendall Hunt Publishing, Iowa.

Part 2: Data Analysis

Graph the amount of dissolved oxygen (mg/L) in the Hudson River over a 24-hour time period in late July and August 2006, as measured by scientists near Cheviot, NY.

Time	DO (mg/L)
0:00:00	6.7
1:00:00	6.55
2:00:00	6.71
3:00:00	6.37
4:00:00	6.08
5:00:00	5.29
6:00:00	5.32
7:00:00	4.55
8:00:00	4.05
9:00:00	5.53
10:00:00	6.39
11:00:00	6.99
12:00:00	7.62
13:00:00	9.43
14:00:00	11.16
15:00:00	11.84
16:00:00	8.83
17:00:00	7.63
18:00:00	7.54
19:00:00	7.38
20:00:00	6.61
21:00:00	6.31
22:00:00	6.61
23:00:00	6.78

When you are finished with your graph, answer the questions below.

1. When did the highest levels of dissolved oxygen occur? The lowest?
2. What time of year was this sample taken? What effect do you think this has on the results? How would these data be different if the sample was collected in December?
3. What do you think caused the high level of DO that occurred later in the evening?
4. What process takes place during the day that might increase the DO?
5. What process do you think takes place at night that might decrease the DO?
6. What other types of things might affect the dissolved oxygen levels?
7. What time of day do you think is the hardest time for plants and animals? Why?
8. Are there other factors that could influence dissolved oxygen besides the aquatic organisms in the River?