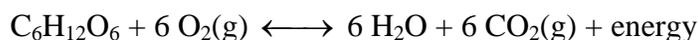


Cell Respiration

Cell respiration refers to the process of converting the chemical energy of organic molecules into a form immediately usable by organisms. **Glucose** may be oxidized completely if sufficient **oxygen** is available and is summarized by the following reaction:



All organisms, including plants and animals, oxidize glucose for energy. Often, this energy is used to convert ADP and phosphate into **ATP**. It is known that yeast cells undergo cell respiration. Using your collected data, you will observe cellular respiration of yeast cells.

Using the O₂ Gas Sensor, you will monitor the oxygen consumed by yeast cells during cell respiration.

OBJECTIVES

In this experiment, you will

- Use an O₂ Gas Sensor to measure concentrations of oxygen gas during cell respiration.

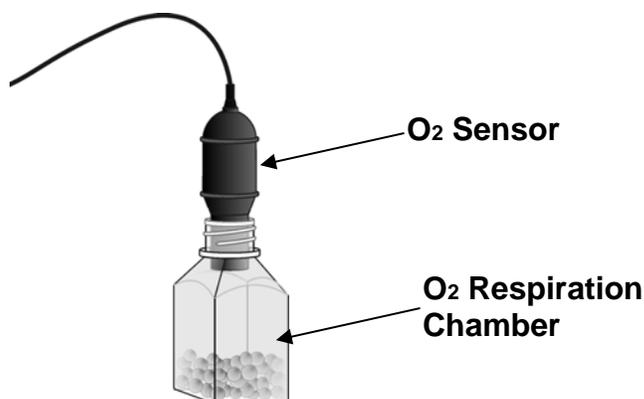


Figure 1

MATERIALS

LabQuest
LabQuest App
Vernier O₂ Gas Sensor
Active Dry Yeast
Grape Juice

250 mL respiration chamber
thermometer
On 1000mL flask
Logger *Pro* (optional)

PROCEDURE

1. Connect the O₂ Gas Sensor to LabQuest and choose New from the File menu. If you have an older sensor that does not auto-ID, manually set up the sensor.
2. On the Meter screen, tap Rate. Change the data-collection rate to 0.1 samples/second and the data-collection length to 1200 seconds.
3. Bring your O₂ Respiration Chamber to the prep table and obtain 50mL of the Yeast/Grape juice solution from the teacher.
4. Place the O₂ Gas Sensor into the bottle as shown in Figure 1. Gently push the sensor down into the bottle until it stops. The sensor is designed to seal the bottle without the need for unnecessary force. Wait 2 minutes before collecting data. Click on the **table** icon to begin recording your data. On the table, click Oxygen Gas %. Change the decimal place from two to one.
5. After 2 minutes, begin collecting data by clicking the play button in the lower left hand corner. Data will be collected for 20 minutes.
6. Look at the table on the left of the computer screen. Copy the data from your computer onto **Table 2**. Record your data every minute for Oxygen Gas %. You should have 20 data points when finished.
7. While collecting data, answer the following questions:
 - a. From where are the yeast cells obtaining their source of glucose? _____
 - b. What process is occurring in the O₂ Respiration Chamber in which the yeast cells are breaking down glucose in the presence of oxygen? _____
 - c. Where does the process in “b” (above) occur in cells? _____

 - d. At the 15 minute (900 sec.) mark during your data collection, carefully observe the Yeast/Grape juice solution in the O₂ chamber.

The bubbles that you see forming are from what gas being produced? _____
8. When data collection has finished, remove the O₂ Gas Sensor from the respiration chamber.
9. Fill the respiration chamber with water. Swirl and then empty it. Thoroughly dry the inside of the respiration chamber with a paper towel.
10. Using a ruler, begin plotting your data points from step 6 on **Graph 1**. Connect your 20 points. When all of the points have been plotted and connected, draw a best fit line and calculate the line's slope. Record your calculated slope in **Table 2**. The slope is the rate of respiration for yeast cells.
11. Make sure you have collected all data before closing this experiment.
12. Before you turn off the interface, go to File, Quit, and click discard. When you have done this, you may now turn the power off on the interface.

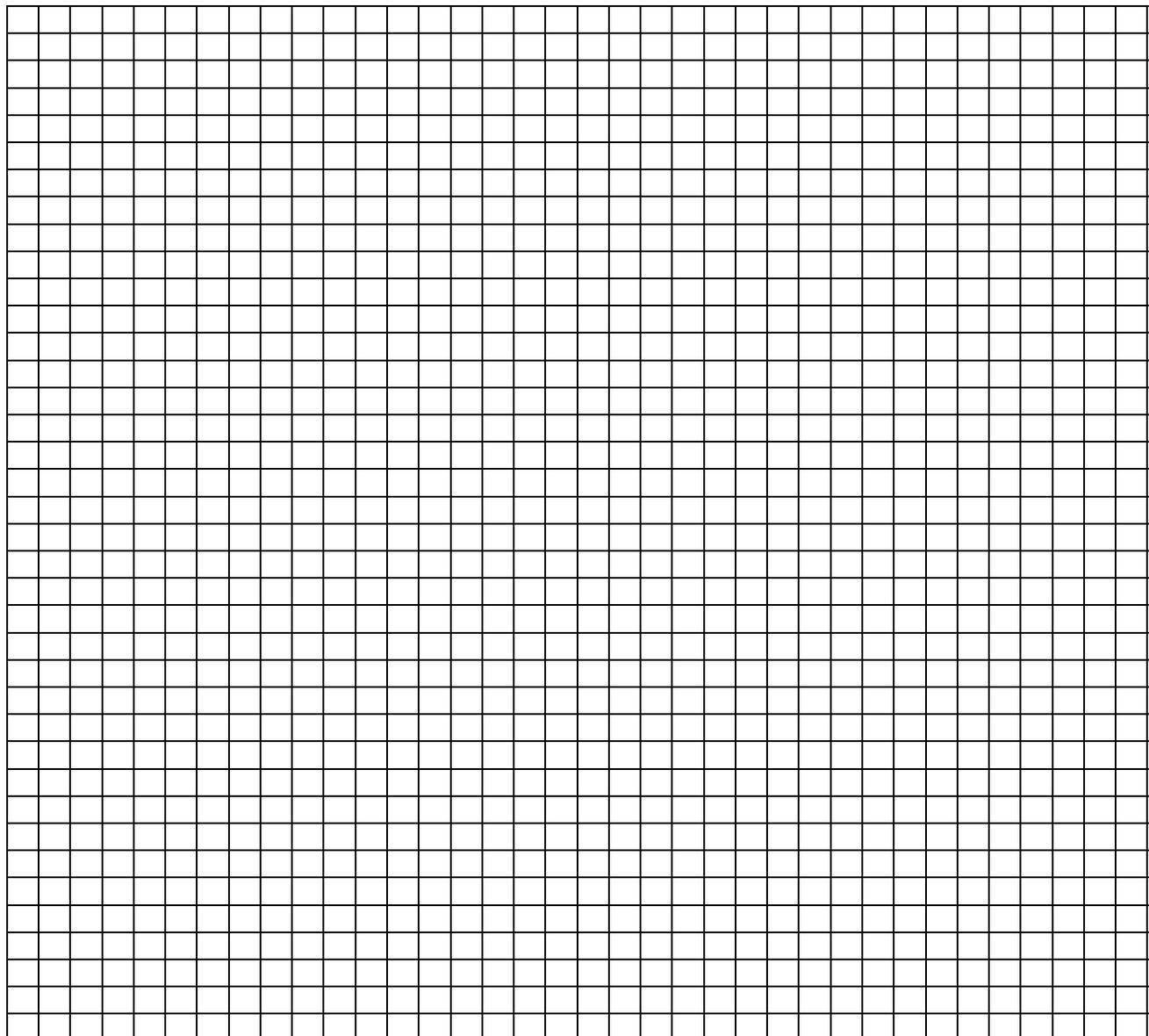
DATA

Table 2	
Oxygen Gas % for Yeast Cells (Data for Graph 1)	
(X)	(Y)
Time (minutes)	Oxygen Gas %
1 (60 sec.)	
2 (120 sec.)	
3 (180 sec.)	
4 (240 sec.)	
5 (300 sec.)	
6 (360 sec.)	
7 (420 sec.)	
8 (480 sec.)	
9 (540 sec.)	
10 (600 sec.)	
11 (660 sec.)	
12 (720 sec.)	
13 (780 sec.)	
14 (840 sec.)	
15 (900 sec.)	
16 (960 sec.)	
17 (1020 sec.)	
18 (1080 sec.)	
19 (1140 sec.)	
20 (1200 sec.)	

Table 2		
Peas	Rate of Respiration (%/min)	
Yeast Cells, room temp. (your calculated slope from Graph 1)		

Graph 1

Oxygen Gas % of Yeast Cells vs. Time



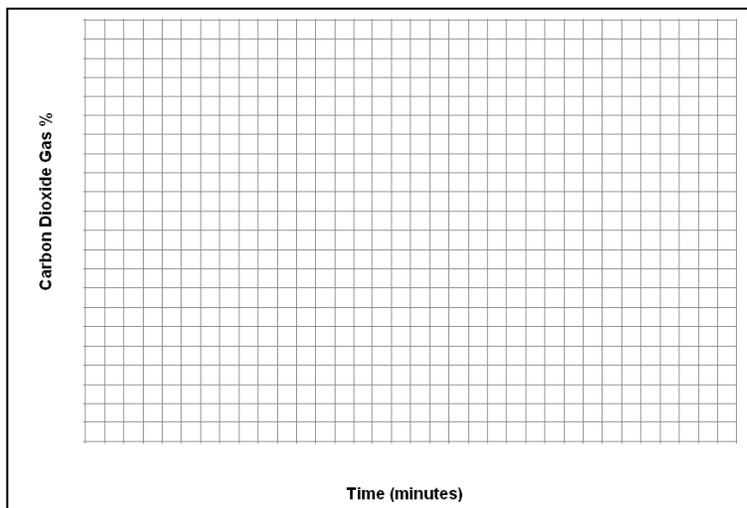
QUESTIONS

1. Based on the slope of your best fit line, what happened to the Oxygen Gas % over the 20 minute period?

Explain why.

2. When all of the oxygen gas in the chamber is consumed, what process will begin in order for the yeast cells to create energy?
3. Using the graph below, draw a line that illustrates what the graph would have looked like if the O₂ Gas sensor were replaced by a CO₂ Gas sensor.

Explain your graph.



4. Write the overall equation for cellular respiration.
5. If you were asked to create a fermentation lab, what other reactants or products could be measured?