Lab: Cell Respiration: Make up Lab
<u>Use the overview, introduction, background information and the Results</u> to finish the lab questions, graph and table. This will give you the 80 points for the Lab, if you would like to write it up for the 100 points you may do this.

Name_____
Period_____

Overview

You will work with seeds that are living but **dormant.** A seed contains an embryo plant and a food supply surrounded by a seed coat. When the necessary conditions are met, germination occurs, and the rate of cellular respiration greatly increases. In this experiment you will measure oxygen consumption during germination. You will measure the change in gas volume in respirometers containing germinating peas, non-germinating peas or glass beads.

Introduction

Cellular respiration is the release of energy from the breakdown of sugar in the mitochondria. The equation below shows the complete breakdown glucose. Oxygen is required for this energy-releasing process to occur.

$C_6H_{12}O_6 + 6O_2 \text{-----> } 6\ CO_2 + 6\ H_2O + ATP$

By studying the equation above, you will notice there are two ways cellular respiration could be measured.
1. Consumption of O_2 (How much oxygen is consumed in cellular respiration?)
2. Production of CO_2 (How much carbon dioxide is produced by cellular respiration?)

Relative volume of O_2 consumed by germinating peas and non-germinating peas will be measured.

Background Information
In this experiment, the CO_2 produced during cellular respiration will be removed by potassium hydroxide (KOH) and will form solid potassium carbonate (K_2CO_3) according to the following reaction.
$CO_2 + 2\ KOH \text{----> } K_2CO_3 + H_2O$

As cellular respiration occurs the respirator will draw in water in proportion to the amount of oxygen used.

The amount of oxygen consumed will be measured over a period of time.
Three respirometers should be set up as follows:

Procedure

1. Prepare a room-temperature bath. (approx. 25^o C)

2. Obtain 10 germinating peas, 10 non-germinating peas and 40 glass beads.

3. To assemble the 3 respirometers, obtain 3 vials, each with an attached stopper and pipette.

4. Place a small wad of absorbent cotton in the bottom of each vial

5. using a dropper, saturate the cotton with 15% KOH (potassium hydroxide). It is important that the same amount of KOH be used for each respirometer.

6. Place a small wad of dry, nonabsorbent cotton on top of the saturated cotton.

7. In the first respirometer place the 10 germinating peas

8. In the second respirometer place 10 non-germinating peas (dry) + glass beads to bring the level equal with the germinating pears (about 10 glass beads)

9. In the third respirometer place enough glass beads so that it is equal with the other two respirometers.

10. Insert the stopper with the calibrated pipette. Make sure that there are no water bubbles in the tube

11. Make a sling of masking tape attached to each side of the water baths. This will hold the ends of the pipettes out of the water.

12. Allow the respirometers to sit for 7 minutes in order to reach equilibration.

13. After 7 minutes put all set-ups entirely into the water. A little water should enter the pipettes and then stop. If the water continues to enter the pipette, check for leaks in the respirometer.

14. Allow the respirometers to equilibrate for 3 more minutes and then record the initial position of the water in each pipette to the nearest 0.01mL (time 0). Check the temperature in both baths and record. Record the water level in the 3 pipettes every 5 minutes for 25 minutes.

Results: As you set up your respirometers they began going through cellular respiration and consuming oxygen. The measurement for the beads alone at 0 minutes is .9 ml, at 5 minutes its .9 ml, at 10 minutes it's .9 ml, at 15 its .9 ml, 20 minutes its .9 ml, and at 25 minutes it's .9 ml. The measurement for the Germinating peas at 0 minutes is .9 ml, at 5 minutes its .85 ml, at 10 minutes it's .81 ml, at 15 its .76 ml, 20 minutes its .71 ml, and at 25 minutes it's .68 ml. The measurement for non-germinating peas at 0 minutes is .9 ml, at 5 minutes its .89 ml, at 10 minutes it's .87 ml, at 15 its .87 ml, 20 minutes its .86 ml, and at 25 minutes it's .85 ml.

Table 1

Temperature (Celsius)	Time (minutes)	Beads alone		Germinating Peas		**Non – Germinating Pea**	
		Water level reading	difference	Water level reading	difference	Water level reading	difference
25 degrees	0						
	5						
	10						
	15						
	20						
	25						

1. In this activity you are investigating the effects of germinating peas, non-germinating peas and beads on oxygen consumption. Identify the hypotheses being tested in this activity.

2. This activity uses a number of controls. What conditions must remain constant? Why?

3. Describe and explain the relationship between the amount of Oxygen consumed and time. What respirometer consumes the most Oxygen and why?

4. Explain the effect of germination (versus non-germination) on pea seed respiration.

5. What is the purpose of KOH in this experiment?

6. Explain why water moved into the respirometer's pipettes.

7. What is the overall equation for cellular respiration?

8. Graph the data putting the time on the x-axis and Oxygen consumption on the y-axis. You will have 3 different lines being graphed, use three different colors (germinating, non-germinating and glass beads)

9. Explain the 3 steps to cellular respiration. Make sure you explain what is used and produced at each step. What is the importance of the electron carriers and where do each step in the process take place.