Cellular Respiration

Fermentation

Fermentation from http://www2.estrellamountain.edu/faculty/farabee/biobk/biobookglyc.html

In this activity you will see the action of yeast cells on glucose and distilled water.

1. Obtain 2 Durham tubes, 2 beakers (100 ml), and 2 test tubes per group. Label the large test tubes with your group name.

2. Fill one beaker with half of active yeast solution and half distilled water, and make sure to mix well with a stir rod. Fill one Durham tube and test tube with this mixture, using a dropper to max-fill. Over a lab sink, invert the Durham tube and place it into the test tube with the distilled water, yeast mixture. No bubble should be in the Durham tube. This might take multiple tries. Carefully, wipe clean the outer test tube and place in a test tube rack.

3. Fill the second beaker with half yeast solution and half grape juice, and stir with a clean stir rod. Repeat the process in Step 2 to load Durham and test tubes.

4. Place the test tube rack in an incubator (temperature of 37 °C).

5. Allow experiment to incubate for about one hour or longer, then examine and analyze results.
Cellular Respiration and Carbon Dioxide Production: Using Carbon Dioxide as an Indicator of Cellular Respiration

Carbon dioxide is a byproduct of cellular respiration. Therefore, we can measure the amount of carbon dioxide as an indicator of cellular respiration. When carbon dioxide combines with water it forms carbonic acid. Bromthymol blue will be used to detect an increase in carbon dioxide concentration. Bromthymol blue is a pH indicator, which turns yellow when the pH decreases or becomes more acidic. In this assignment we will conduct two experiments.

Experiment 1
In this experiment you will determine if your exhaled breath contains a greater concentration of carbon dioxide than is present in the atmosphere.
1. Obtain two test tubes and add 2 ml of tap water with a disposable transfer pipette and 3 drops of bromthymol blue into each test tube.
2. Blow into test tube #1 with a straw for 1-3 minutes (careful not to blow too hard and spill).
3. Use a pipette to pump atmospheric air into the second test tube for 2-3 minutes.
4. Record any color changes.

Experiment 2
In this experiment you will determine if germinating beans produce a greater concentration of carbon dioxide than is present in the air.
1. Obtain two test tubes; add 2 ml of tap water and 3 drops of bromthymol blue to each test tube.
2. Put Durnham tubes into the test tubes to make a platform (to keep the beans out of the solution).
3. In tube #1 place 1-3 germinating beans. In tube #2 do not place anything.
4. Cover the test tubes with paraffilm, put in a rack, and let sit for 24 hours.
5. Record any color changes and results.
Fermentation  Name_______________________  Date_______________

a. Which Durham tube contained more gas? Why?

b. Did the above experiment require oxygen?

c. What type of gas was captured in the Durham tube?

d. What is the experimental variable in this experiment (remember the experimental variable is the factor being tested)?

e. What is the dependent variable (remember the dependent variable is what is measured to determine if the experimental variable has an effect)?

f. How many molecules of ATP are produced when glucose is metabolized during fermentation?

g. Bread is made by mixing flour, water, sugar, and yeast to form dough. Why does the dough rise? What caused all the concavities in a slice of bread?

h. What “toxic” substance is produced when vertebrates undergo fermentation?
**Cellular Respiration and Carbon Dioxide Production**

a. Record the results of your experiments in the table below.

**Carbon dioxide production in humans and germinating pea seeds**

<table>
<thead>
<tr>
<th></th>
<th>Color of bromthymol blue after experiment</th>
<th>CO₂ Concentration (circle appropriate)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Experiment #1: Human Expiration</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tube #1: Exhaled air</td>
<td>____________</td>
<td>Increased</td>
</tr>
<tr>
<td>Tube #2: Atmospheric air</td>
<td>____________</td>
<td>No Change</td>
</tr>
<tr>
<td><strong>Experiment #2: Germinating Beans</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tube #1: Germinating Beans</td>
<td>____________</td>
<td>Increased</td>
</tr>
<tr>
<td>Tube #2: Atmospheric air</td>
<td>____________</td>
<td>No Change</td>
</tr>
</tbody>
</table>

b. What is the purpose of tube #2 in experiment 1 and 2?

c. What conclusion can you draw from the results of experiment 1?

What conclusion can you draw from the results of experiment 2?