

Laboratory 7

Cellular Respiration

Student Tip Sheet

Introduction

Studies of cellular metabolism processes such as fermentation and aerobic respiration can be some of the more difficult areas of study for students of introductory biology. Most topics of study can be mastered by careful review of notes and lab activities. However, there is little substitute for memory work of the lecture notes of metabolism. Students, the best method that I have found is to obtain a stack of scratch paper and begin to write and draw and rewrite and redraw the steps of what becomes what and why until you know it verbatim. Only then can you really begin to understand the lab activities and grasp the whole picture of what is happening in metabolism. The sooner the memory work is complete the better. Then, the true learning and understanding can begin.

Ideally, lab demonstrations will help you to at least grasp the concepts and get the big picture of the formulas. Then the lecture information will explain the “why” of the lab demonstrations. Unfortunately, exercises such as the following do not always give consistent data. Assuming that your experimental setup and techniques are correct, record your actual results without using a “fudge factor.” Do not be concerned if the results seem unreasonable. Be reminded that when averaging hundreds of test results the numerical data does give surprisingly accurate information.

Fermentation and aerobic respiration are processes of metabolism that are similar yet very different. Fermentation does not use oxygen and therefore, can be, termed anaerobic. Conversely, aerobic respiration requires oxygen. Included in this lab are demonstrations of each.

Fermentation (anaerobic respiration – no oxygen)

Read the directions carefully for the assembly of the fermentation tubes that are also called Durham Tubes. The assembly requires some dexterity and practice. You will soon be an expert at this production, but be patient with yourself at first. Only use the double tubes you assemble that have minimum space showing at the top of the smaller tube. It is important that these are assembled correctly.

You are going to test different types of sugar to determine the best type to use for fermentation. This exercise will quantify the experimental results by measuring the amount of gas production in the smaller tube inside the larger one. The gas will displace the liquid and therefore, can be, seen and measured. The best scientific experiments measure results and have hard data for comparison. Subjective terms such as “more, less, fewer, a lot, or almost brown,” for example, do not give explicit information and are not as useful as experimental results.

Aerobic Respiration (requiring oxygen)

This demonstration requires careful attention to detail. This also is another experiment that can give inconsistent data. Record your measurements as you see them and average your results with your classmates. Hopefully the averages will be reliable.

Your instructor may have other exercises that can provide support for these exercises. Take advantage of these additional demonstrations or CD-ROMs that can be very helpful.