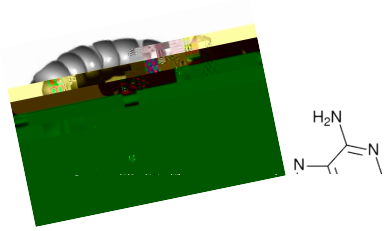
Lab 8
Cellular Respiration
(April 2014)



Section 1 – Review of Energy Molecules

[2] Welcome to this week's lab on cellular respiration. This lab continues the exploration of how organisms obtain and use energy. As you study this diagram you will see that photosynthesis and cellular respiration are basically opposite reactions. In photosynthesis, autotrophs capture light energy and store the energy in glucose. In cellular respiration, organisms break down glucose to release energy

[3] Before getting to respiration, l

[13] Once glycolysis is complete there are two pathways that can be followed. If oxygen gas is ***not*** present, an organism's cells will undergo fermentation. This pathway doesn't yield any additional ATP but is important is setting the stage for additional glycolysis. We'll come back to this concept at the end of the lab. Fill in zero ATP in the diagram in Section 2 for fermentation.

[14] The other possible pathway after glycolysis is cellular respiration. This reaction requires oxygen gas and will yield an additional 30 or more ATP depending on the organism and the type of cells involved. Fill in this last energy yield in the diagram in Section 2 and then continue.

[15] Try answering this question.

[16] Now that you know that the presence or absence of oxygen gas will determine the pathway, let's see what happens when there is no oxygen available. You may want to jot down the answers to the next few questions in Section 2 as we go along.

[17] Again the actual pathway depends on the type of organism. Plants produce ethyl alcohol and carbon dioxide. This type of fermentation is used in the production of alcoholic beverages. It is also used in baking. Here you can see an example of how the carbon dioxide produced by yeast makes bread rise. The process of plant fermentation is diagrammed for you.

[18] Animals have a different fermentation pathway as you can see here. Animal muscle cells will undergo fermentation when the cell's

Section 3 – Volumeters and Measuring Air Pressure

[27] The experiment you are going to perform this week will allow you to measure a meal worm's rate of cellular respiration. Look again at the overall equation. This is a balanced equation and if you know the number of one molecule used, you also know the number of other molecules used or produced just as you

[43] Another thing to think about is why we need two volumeters. Why do we need a control? What is its

Section 5 –

[87] Once the three carbon intermediate is produced, it will breakdown into pyruvate over several steps and release enough energy to produce four molecules of ATP. High energy electrons will also be released and be picked up by NAD^+.

[88] OK, t

[102] As before, we'll take one step at a time. The first thing that happens is that NADH and $FADH_2$ enter the cristae and give up their high energy electrons to an electron transport chain. They also give up their hydrogen ions.

[103] The second step is where the high energy electrons are passed through a transport chain of molecules embedded in the cristae. As they pass from one molecule to another they give up some of their energy which is used to produce ATP.

[104] In the last part of the electron transport chain, oxygen gas, what you have been breathing in, picks up the now low energy electrons and hydrogen ions to produce water.

[105] OK, time to sum up again.

[106] Here is another question.

[107] See if you are following the energy flow.

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