Cellular respiration lab report answers

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Name: *Tae Hun Lee*
Partners: *Yu Lynn*

Date of experiment: *02/05/2010*

Yeast Fermentation using different types of Sugar

Aim
How does the different types of sugar affect the growth of yeast?

Hypothesis
I think black sugar + yeast will produce more CO2 than the others.

Variables

Input variable: *Types of sugars (white, brown, black). I will change it by putting different types of sugar into the water in which the yeast would be placed in.*

Output variable: *weight after a specific amount of time. I will measure it by using a electric balance and a stopwatch.*
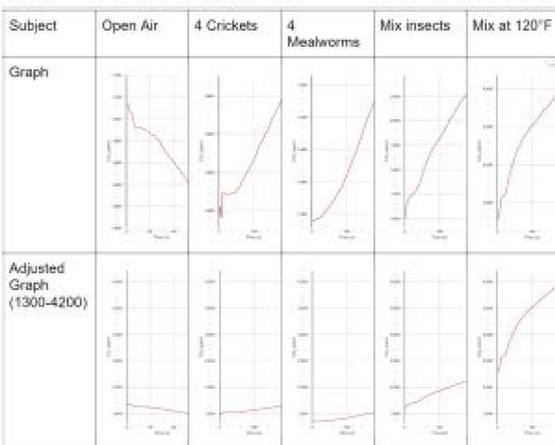
Control variables

Control variable 1: *Amount of yeast. I will keep it the same by using an electronic scale to measure the yeast before it is used.*

Control variable 2: *temperature, amount of water. I will keep it same by the water shall be measure before it is heated to the right temperature.*

Control variable 3: *amount of time. I will keep it the same by using a stopwatch to measure the time.*

Control variable 4 : *amount of sugar, I will keep it the same by using an electronic balance to measure it.*

Materials:

- 4 beakers (250ml)
- white sugar (15g)
- brown sugar (15g)
- black sugar (15g)
- electronic balance
- yeast
- water (40ºC)
- spatula

Subject	Open Air	4 Crickets	4 Mealworms	Mix insects	Mix at 120°F
Graph					
Adjusted Graph (1300-4200)					

Name: Da Eun Kim

Partners: Charles and Eileen

Date of experiment: Oct 20ᵗʰ, 2010

Yeast Experiment

Aim: To find how much gas is produced when the amount of sugar changes.

Hypothesis: My hypothesis is that more sugar we put, more gas will be produced because sugar is the source of food for the yeast so the more sugar that the yeast has, the more energy will be produced and the gas will be produced more.

Variables:

Input variable: Amount of sugar

Firstly, we will start the experiment with 4 grams of sugar and I will increase the amount by 1.5 gram (4g, 5.5g, and 7g) for every experiment. I will measure the amount of sugar by using electronic scale.

Output variable: Carbon dioxide

I will measure the gas using gas collection tube in ml and see how much carbon dioxide produced by yeast.

Control variables:

Control variable 1: Amount of water

Firstly I will measure the amount of water using measuring cylinder. Amount of water will be 100ml. Then we will put it in conical flask.

Control variable 2: Amount of yeast

Amount of yeast will be 4 grams.

Control variable 3: Type of sugar

We will use castor sugar to do this experiment.

Name: _____ Period:_____ Date: _____

Teacher's Name: _____ Course: _____

Cellular Respiration Lab

Introduction: Cellular respiration is the process that allows cells to convert glucose (sugar broken down from food sources) into energy. Aerobic cellular respiration takes place in the presence of oxygen and produces carbon dioxide and water as byproducts. In this experiment we will use yeast, unicellular eukaryotic organisms, to demonstrate cellular respiration. Consider the following chemical reaction:

$$C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O + \text{Energy (ATP)}$$

$$Glucose + Oxygen \rightarrow Carbon\ Dioxide + Water + \text{Energy (ATP)}$$

What are the byproducts of the sugar, glucose ($C_6H_{12}O_6$) and oxygen (O_2)? Write your answers here and include whether you think they are solid (s), liquid (l), gas (g) or aqueous (aq): _____

You also carry out this chemical reaction. After completing this experiment, try blowing up a balloon yourself – you breathe in oxygen and exhale carbon dioxide due to this process of cellular respiration. Once you have inflated your two experimental balloons you can follow the instructions for "detecting carbon dioxide."

Purpose:

In this lab we will gather evidence for or against yeast and humans releasing CO₂ when respiring.

Materials (per group):

2 balloons	1 packet of active yeast	2, 125 mL Erlenmeyer flasks
2 straws	Lime water ($Ca(OH)_2$)	1, 500 mL Erlenmeyer flask
BTB in H_2O	Sugar	CO_2 gas probe (if accessible)

Performing Cellular Respiration (use the right-hand box for notes and observations).

1. Measure 300mL of lukewarm water in a 500mL Erlenmeyer flask. Dissolve 5 grams of sugar into the flask. Add 1 packet of yeast to the flask.	

III. Results and Discussion

Substrate Present

As seen with the experiment the type of substrate to be used in Respiration is quite important. As for the case of the yeast, **if glucose, starch and maltose are placed in different tubes, glucose will still be the fastest.** Though there are numerous glucose molecules in both maltose and starch, the yeast will need to release enzymes which may not be available to them and even if they are it would take time compared to an environment where glucose is readily available.

Lab 6 Cellular RespirationIntroductionCellular respiration is the release of energy from organic compounds by metabolic chemical oxidation in the mitochondria within each cell. Enzyme mediated reactions are required. The equation for cellular respiration is:C6H12O6 + 6 O2 à 6 CO2 + 6 H2O + 686 kilocalories of energy/mole of glucose oxidizedSeveral different measures can be taken from this equation. The consumption of oxygen, which will tell you how many moles of oxygen are consumed during cellular respiration. That is what was measured in this lab. The production of CO2 can also be measured. And of course the release of energy can be measured. Cellular respiration is a catabolic pathway and the mitochondria houses most of the metabolic equipment for cellular respiration. It will break down glucose in what we call an exergonic reaction. Like previously said, the consumption of oxygen molecules will be measured in a gas form. One must know the physical laws of gases when working with them. The laws are summarized by the following equation.PV=NrtWhere:P stands for the pressure of the gasV is the volume of the gas in the number of molecules of gasR is the gas constant (fixed value)T is the temperature of the gas (in K°)The CO2 produced during cellular respiration will be removed by potassium hydroxide (KOH) and will form a solid potassium carbonate (K2CO3) when the following reaction occurs: CO2 + 2 KOH à K2CO3+ H2OSince the CO2 is removed, the change in the volume of gas in the respirometer will be directly related to the amount of oxygen consumed. If the water temp and volume stay constant then the water will move toward the region of lower pressure. During respiration, oxygen will be consumed and its volume will be reduced because the CO2 is being converted to a solid. The net result is a decrease in gas volume in the tube and a decrease in pressure of the tube. The vial with beads will detect any atmospheric changes.HypothesisSeveral different things will affect the rate of O2 consumption. The non germinating peas will have a lower rate than the germinating peas and the coldness of the water will slow the rate.MaterialsThe materials used for this lab were: a 100 mL graduated cylinder, 6vials,germinating peas, dry peas, glass beads, 2 water baths, absorbent cotton and non-absorbent cotton, weights, KOH, water, stoppers, pipettes, rubber bands, masking tape, glue, thermometer, ice, a pencil, and paper.MethodsSet up a 25° C and a 10° C water bath. Ice may be used to obtain 10° C.Respirometer 1:Obtain a 100 mL graduated cylinder and fill it with 50 mL of H2O.Drop in 25 germinating peas. Determine the amount of water displaced. Pea volume =11 mL. Take peas out and place on paper towel.Respirometer 2: refill cylinder with 50 mL of H2O. Drop 25 dry peas into the cylinder. Add glass beads to obtain the same volume that you got in respirometer 1. Remove peas and beads to a paper towel.Respirometer 3: Add 50 mL of water to the cylinder. Put only beads in to get an equivalent volume to the first 2 respirometers. Put on paper towel when finished. Repeat respirometer 1 steps for respirometer 4. And 2 for 5. And 3 for 6. Listen to your teacher on how and where to set up the respirometers. Now fill your vials with the required items shown in the table and in figure 5.1. Seal the vials after your items have been put in to stop any gas or water leaks. Place a weighted collar onto the bottom of your vials so they will stay submerged in the water bath. During equilibration use masking tape attached to each side of the water baths to hold the respirometers out of water for 7 minutes. Vials 1-3 should be in the 25° C water bath and vials 4-6 should be in the 10° C water bath. Finally submerge totally the respirometers and let them equilibrate for 3 more minutes. Read the water line where the oxygen is and record in intervals of 5 minutes all the way up to 25 minutes. Record in table 5.1.ResultsTable 5.1: Measurement of O2 Consumption by Soaked and Dry Pea Seeds at Room Temperature and 10° C Using Volumetric MethodsBeads AloneGerminating PeasDry Peas and BeadsReading at time XDiff.Reading at time XDiff.Corrected Diff.Reading at time XDiff.Corrected Diff.Initial-0.351.621.320-51.33.021.20.42.41.32-0.025-101.33.021.12.50.481.3.02.010-151.32.031.02.60.571.29.03.015-201.32.03.92.7.671.3.02.01 Initial-0.481.371.46 0-51.48.01.15.22.221.45.01.01 5-101.45.03.98.24.44.02.01 10-151.43.05.84.53.481.43.03.02 15-201.41.07.70.67.61.41.05.02In this activity, you are investigating both the effects of germination versus non-germination and warm temperature versus cold temperature on respiration rate. Identify the hypothesis being tested on this activity. The nongerminating peas will have a slower rate of respiration than the germinating peas and the coldness of the water will slow down the rate as it gets colder.This activity uses a number of controls. Identify at least three of the controls, and describe the purpose of each. The three controls are the beads in one vial controlling the barometric pressure, the KOH keeps equality in the consumption of CO2, and the time intervals give each vial the same amount of time so the results will not be affected.Describe and explain the relationship between the amount of oxygen consumed and time. The relationship was pretty constant, there may have been a gradual rising in O2 consumption.5. Condition Calculations Rate in mL O2/ minute Germinating Peas/ 10 oC(1.62-.92)20.035 Germinating Peas/ 20 oC(1.37-.7)20.0335 Dry Peas/ 10 oC(1.32-1.30)20.001 Dry Peas/ 20 oC(1.46-1.41)20.0025Why is it necessary to correct the readings from the peas with the readings from the beads? The beads were just a control, experiencing no gas change.Explain the effects of germination (versus non-germination) on pea seed respiration. The germinating seeds had a higher metabolic rate and therefore consumed more oxygen than the nongerminating. Above is a sample graph of possible data obtained for oxygen consumption by germinating peas up to about 8 oC. Draw in predicted results through 45 oC. Explain your prediction. Once the temperature gets above about 30 degrees C, the enzymes will denature and that will be the end of respiration.What is the purpose of KOH in this experiment? The KOH will take the CO2 and turn it to a precipitant at the bottom of the vial and it will have no affect on the O2 readings.Why did the vial have to be completely sealed under the stopper? The vial had to be sealed or gas would leak out and water could leak in and affect the results.If you used the same experimental design to compare the rates of respiration of a 35g mammal at 10 oC, what results would you expect? Explain your reasoning. Respiration would be higher in the mammal because they are warm-blooded.If respiration in a small mammal were studied at both room temperature (21 oC) and 10 oC, what results would you predict? Explain your reasoning. The rate of respiration would be higher in the 21-degree bath because the mammal would perform better when its body was more comfortable.Explain why water moved into the respirometer pipettes. The water moved in the vial because it was fully submerged in water but it came to a stop when it met the oxygen coming out of the vial.14. Design an experiment to examine the rates of cellular respiration in peas that have been germinating for 0, 24, 48, and 72 hours. What results would you expect? Why? You could put peas in vials each from a time interval above. You would have a vial with just started germinating peas, one with 24 hour germinating peas, another with 48 hour peas, and the last with 72 hour peas. Place them in a room temp water bath. Take readings at intervals of 5 min up to 20 min. The 72-hour peas should have more O2 consumption because they will use more oxygen because they have been germinating the longest. The just started germinating peas would use the least O2 because they haven't been germinating vary long. The other two will be in the middle of the "just started peas" and the "72 hour peas".Error AnalysisMany errors could have been made in this lab. There could have been miscalculations when trying to equal the pea volumes. The stoppers might not have been sealed and gas could have been lost from the vials affecting the results with vengeance. The water temperatures had to be maintained precisely or the results would not be what they should be. There was also a lot of math in this lab when figuring results and many numbers could have been affected by this poor math.Disussion and ConclusionThis lab showed many things about their rates of cellular respiration. This lab showed that germinating peas consume more O2 than nongerminating peas. The colder temperature also slowed the rate of oxygen consumption. The oxygen could be clearly seen because of the following reactionCO2+2KOH à K2O3 +H2OThis reaction gets rid of the CO2 so that it would not affect the readings of oxygen. It is absorbed by KOH to give you a precipitant K2CO3 + H2O. I conclude that the rate of O2 consumption is directly proportional to the respiration rate in that when the rate increases the gas consumption is low then the rate is low. Organisms go through cellular respiration more proficiently when the body of the organism is comfortable with its outside temp and environment. This lab showed many things affecting the rate of cellular respiration. 1. Koz 1 INTERNATIONAL BACCALAUREATE BIOLOGY LAB REPORT YEAST FERMANTATION --- Candidate: Serra Koz Supervisor: --- May 2014 2. Koz 2 BACKGROUND INFORMATION Cell respiration is the gradual breakdown of nutrient molecules such as glucose and fatty acids in a series of reactions that ultimately release energy in the form of ATP. Glucose is probably the most commonly used source of energy. Each glucose molecule is broken down by enzymes in a number of stages, which release energy in small amounts as each covalent bond is broken. If there is insufficient glucose available, fatty acids or amino acids can be used instead. The first stage in cell respiration is glycolysis. Glucose that is present in the cytoplasm of a cell is broken down by a series of enzymes, to produce two molecules of a simpler compound called pyruvate. As this occurs, there is a net production of two molecules of ATP. glucose → 2 pyruvate + 2 ATP The next stage of cell respiration depends on whether or not oxygen is available. In the presence of oxygen, aerobic respiration can take place; without it, respiration must be anaerobic. Aerobic respiration is the most efficient way of producing ATP. Aerobic respiration is carried out by cells that have mitochondria and it produces a great deal of ATP. Pyruvate molecules produced by glycolysis enter the mitochondria and are broken down, or oxidized, in a series of reactions that release carbon dioxide and water and produce ATP. The two pyruvate molecules from glycolysis first lose carbon dioxide and become two molecules of acetyl CoA in the link reaction. Acetyl CoA then enters a stage called the Krebs cycle and is modified still further, releasing more carbon dioxide. Finally, products of the cycle react directly with oxygen and the result is the release of large amounts of ATP. The original glucose molecule is completely broken down to carbon dioxide and water so the equation for aerobic respiration is often shown as: glucose + oxygen → carbon dioxide + water + 38 ATP 3. Koz 3 Anaerobic respiration occurs in the cytoplasm of cells. In animal cells, the pyruvate produced by glycolysis is converted to lactate, which is a waste product and is taken out of the cells. Anaerobic respiration occurs in cases where, for example, a person is doing vigorous exercise and their cardiovascular system is unable to supply sufficient oxygen for aerobic respiration. One consequence of anaerobic respiration and a build-up of lactate in the muscles is the sensation of cramp. pyruvate → lactate In other organisms, such as yeast, anaerobic respiration is also known as fermentation, and produces a different outcome. The pyruvate molecules from glycolysis are converted to ethanol (alcohol) and carbon dioxide. pyruvate → ethanol + carbon dioxide In yeast cells, the absence of oxygen (anaerobic conditions) is a signal that switches on the process of yeast fermentation. RESEARCH QUESTION: How does the glucose amount affects the rate of yeast fermentation according to room temperature (27°C), amount of oxygen in the environment, used amount of water, used amount of yeast, temperature of water and time duration for the fermentation? HYPOTHESIS: If the amount of glucose is increased, then the rate of fermentation increases. 4. Koz 4 VARIABLES Independent Variables Amount of Glucose/g The amount of glucose was change every time because the effects of glucose observed in this investigation. It measured by the scale. Dependent Variables CO2 Formation The CO2 formation is changed during the experiment and measured by the ruler. Room temperature/°C (27°C) The room temperature was not change during the experiment and measured by the thermometer. All the external factors were tried to be constant. Amount of Water/mL The amount of water which is added in the yeast solution measured by the graduated cylinder and for each trial it was same during the experiment. Controlled Variables Temperature of Water/°C The temperature of water was same during the experiment. Temperature affected the fermentation rate, and it can be accelerate the fermentation. It will affect the enzyme activity for fermentation. Time Duration for Fermentation/ min. The recording data of the CO2 fermentation recorded at the same time which is 1st , 2nd , 3rd , 4th , and 5th minutes and measured by the chronometer. Amount of Yeast/g The amount of yeast were same during the experiment. If the amount of yeast increased, the fermentation increased as well. Amount of Oxygen in the Environment The external factors tried to be constant and amount of oxygen were same during the experiment. Oxygen is used into the fermentation process and if it changed fermentation amount also changed. Table 1 shows the dependent, independent and controlled variables of the experiment. 5. Koz 5 MATERIALS Yeast Pure Water (60 g) 30 g Glucose 100 mL Beaker(±0.5) 100 mL Graduated Cylinder (±0.5) Chronometer (±1) Stirring Rod Thermometer Funnel Scale PROCEDURE i. Measure 5 g of yeast and 20 g pure water and put into the beaker. ii. Measure the ... g of glucose and put into the beaker. iii. Stir the solution and put into the test tubes. iv. Start the chronometer and measure the length of water in1st , 2nd , 3rd , 4th , 5th , 6th , 7th , 8th , 9th and 10th minutes by the aid of the ruler. vi. Record the data. vii. Measure the .... G of glucose and repeat the process i, iii, iv, v and iv for the .... g of glucose. viii. Repeat the experiment. 6. Koz 6 DATA COLLECTION AND PROCESSING CONCLUSION This experiment investigates the relationship between the amount of glucose and fermentation rate. As hypothesis refers to if the amount of glucose increases, hence the time of the yeast fermentation increases. ... Consequently, the data is as follows: PREFERENCES 1. Walpole, B., Merson-Davies A. and Dann L. (2011). Biology for the ib diploma Cambridge: Cambridge University Press. 2.

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