

Introduction

Cellular Respiration is the process of releasing energy from the breakdown of glucose. Respiration takes place in every living cell in order to produce energy. Mitochondria, the organelles associated with energy production in cells, are where respiration takes place. Inside the mitochondria, a complex reaction takes place over and over in order to produce molecules of ATP, which living things use for energy to support all necessary functions. There are two main types of respiration, aerobic and anaerobic.

Aerobic means “with air”. This type of respiration needs oxygen for it to occur.

Anaerobic means without air (“an” means without). Sometimes there is not enough oxygen around for an organism to respire, but they still need energy to survive. Instead they carry out respiration in the absence of oxygen; This is called anaerobic respiration. Anaerobic respiration is not as efficient as aerobic and only a small amount of energy is released. There are two main types of anaerobic respiration, alcoholic fermentation and lactic acid fermentation.

Lactic acid fermentation involves lactic acid as an end product and occurs in human muscle cells as well as bacteria found in yogurt. Our muscles need oxygen and glucose to respire aerobically to produce energy. Sometimes, when we carry out vigorous exercise, our heart and lungs are not be able to get sufficient oxygen to our muscles in order for them to respire. In this case muscles carry out anaerobic respiration. As well as this inefficiency, a poisonous chemical, lactic acid, is also produced. If this builds up in the body, it stops the muscles from working and causes a cramp.

Alcohol fermentation involves ethanol as an end product and occurs in yeasts and other bacterial forms. Have you ever wondered why bread dough will “rise?” Bread dough contains yeast, a single-celled organism that gets its energy from sugar- similar to how the cells in your body do. Bread rises because yeast eats sugar and burps carbon dioxide, which gets trapped by the bread's gluten. The more sugar your yeast eats, the more gas that gets formed, and the higher the bread rises!

Visit the following link to learn more about respiration in yeast: <https://www.youtube.com/watch?v=FYCICHVT00M>

Pre Lab Questions (to be answered in your notebook):

1. How can we measure the rate of cellular respiration in yeast? *You must collect 2 forms of data.
2. Make a concept map/graphic organizer to show the relationship between the following words:
alcoholic fermentation; lactic acid fermentation; yeast; human muscles; bacteria; aerobic respiration; anaerobic respiration; low oxygen level; ethanol; lactic acid; less efficient in creating ATP
3. Pose a testable question that will describe how one variable affects the rate of cellular respiration in yeast.

You will design and conduct an experiment that tests how one variable affects the rate of cellular respiration in yeast using the following materials: -3 bottles -3 packets of yeast -6 Sugar Packets -3 balloon -warm water

As a group, agree upon a testable question that will describe how one variable affects the rate of cellular respiration in yeast.

Write your question in the space below:

Complete the investigation design diagram (below) to clearly define variables and levels for your experiment:

Investigation Design Diagram

| | | | | |
|---|--|--|--|--|
| Independent Variable: | | | | |
| Levels of IV (How you will change it) | | | | |
| Number of Trials (Number of times you will test IV) | | | | |

Dependent Variable: _____

Constants: _____

| | 3 | 2 | 1 |
|-----------------------------|--|--|--|
| Investigation Design | There are no errors that interfere with the scientist's credibility or the reader's understanding of the experiment. All of the following lab report sections are thorough and correct: -Title -Question -Hypothesis (SMRT) -Materials -Procedure explaining all steps of the experiment | The investigation is designed with few errors that interfere with the scientist's credibility and/or the reader's understanding of the experiment. Most of the following lab report sections are thorough and correct: -Title -Question -Hypothesis (SMRT) -Materials -Procedure explaining all steps of the experiment | The investigation is designed with many errors that interfere with the scientist's credibility and/or the reader's understanding of the experiment. Few of the following lab report sections are thorough and correct: -Title -Question -Hypothesis (SMRT) -Materials -Procedure explaining all steps of the experiment |
| Data Table(s) | Table(s) show include a title, units and numbers (including averages) rounded to the nearest tenth. All data is calculated and recorded thoroughly and accurately. There are no major errors. | Most data is calculated and recorded thoroughly and accurately. There are few major errors. | Little data is calculated and recorded thoroughly and accurately. There are many major errors. |
| Graph | The graph clearly shows the relationship between both variables The graph accurately includes all of the following: -a title -axes labels (with units of measure) -units following constant scale -bars/lines represent correct values -a key (or labels) identify all lines/bars | The graph shows the relationship between both variables. The graph accurately includes most of the following: -a title -axes labels (with units of measure) -units following constant scale -bars/lines represent correct values -a key (or labels) identify all lines/bars | The graph partially shows the relationship between both variables. The graph accurately includes few of the following: -a title -axes labels (with units of measure) -units following constant scale -bars/lines represent correct values - a key (or labels) identify all lines/bars |
| Conclusion | Conclusion is thorough. Specific data evidence and reasoning are included. | Conclusion is general. Specific data evidence/reasoning is limited. | Conclusion is incomplete. Specific data evidence/reasoning is not used. |
| Analysis | Analysis contains many thorough, thoughtful, and relevant reflections that communicate purpose, sources of error and next steps. | Analysis contains several thorough, thoughtful, and relevant reflections that communicate purpose, sources of error and next steps. | Analysis contains few thorough, thoughtful, and relevant reflections that communicate purpose, sources of error and next steps. |

| Participation | | | | | |
|---|---|---|---|---|---|
| I often contributed good ideas that were relevant to the topic and task. I came to meetings prepared. I did my share of the work. | 4 | 3 | 2 | 1 | I seldom contributed good ideas. Sometimes I was talking off-task. I did not come to meetings prepared. I did not do my share of the work. |
| Working with Others | | | | | |
| I often compromised and cooperated. I did take initiative when needed and/or listened and respected the ideas of others. | 4 | 3 | 2 | 1 | I seldom compromised and cooperated. I did not take initiative when needed and/or did not listen and respect the ideas of others. |
| Product | | | | | |
| My part of the task is complete and accurate. My work was submitted on time. | 4 | 3 | 2 | 1 | I did not complete my part of the task. The information I presented was inaccurate and/or not done correctly. It was not completed on time. |
| Understanding Content | | | | | |
| I can speak about the topic and group work knowledgeably. I can sum-up the lesson. | 4 | 3 | 2 | 1 | I do not understand what I did in my group. I did not ask or answer questions. I cannot sum-up the lesson. |