

# IS YEAST ALIVE?

## PRE-LAB

Humans use yeast every day. What is yeast, and what are some common uses of yeast?

You can buy yeast to make bread in the grocery store. This yeast consists of little brown grains. Do you think that these little brown grains of yeast are alive? Why or why not?

To find out whether yeast is alive, we first need to think about what makes something alive. What are the 5 characteristics of living organisms?

Today you will design a controlled experiment to test one of the characteristics of life - metabolism. The goal of your team today is to design an experiment, using the materials below, to test your hypothesis. You will run this experiment in class tomorrow.

HYPOTHESIS:

## Materials

Baker's yeast 4g

Sugar 4-8g

Plastic zip-lock baggies (2 per group)

Small water balloons (4 per group)

Test tubes, between 15-25 mL (4 per group)

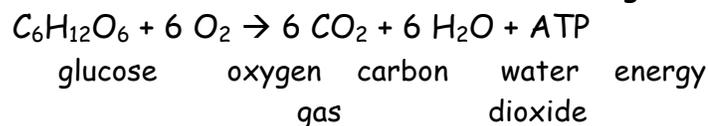
Test tube rack (1 per group)

Container for water that will hold at least 100 mL (1 per group)

The following information will help you set up your experiment. **BEFORE you begin your experiment it must be approved by me!**

The yeast which is used to make bread is *Saccharomyces cerevisiae*. This yeast is a facultative anaerobe, which means that when oxygen levels are low or glucose levels are high, sugar is metabolized without using oxygen, resulting in the production of a small amount of ATP, as well as carbon dioxide and ethanol. As the bread bakes, the ethanol evaporates. Bubbles which contained carbon dioxide provide the fluffy texture of bread. *Saccharomyces cerevisiae* and other members of the same genus are used in making wine and beer, where, obviously, the production of alcohol is a major goal.

In typical (aerobic) cellular respiration, although  $CO_2$  is generated, an equal number of molecules of  $O_2$  are consumed, so there is no net increase in gas molecules.



It is important to understand the difference between aerobic respiration and anaerobic fermentation.

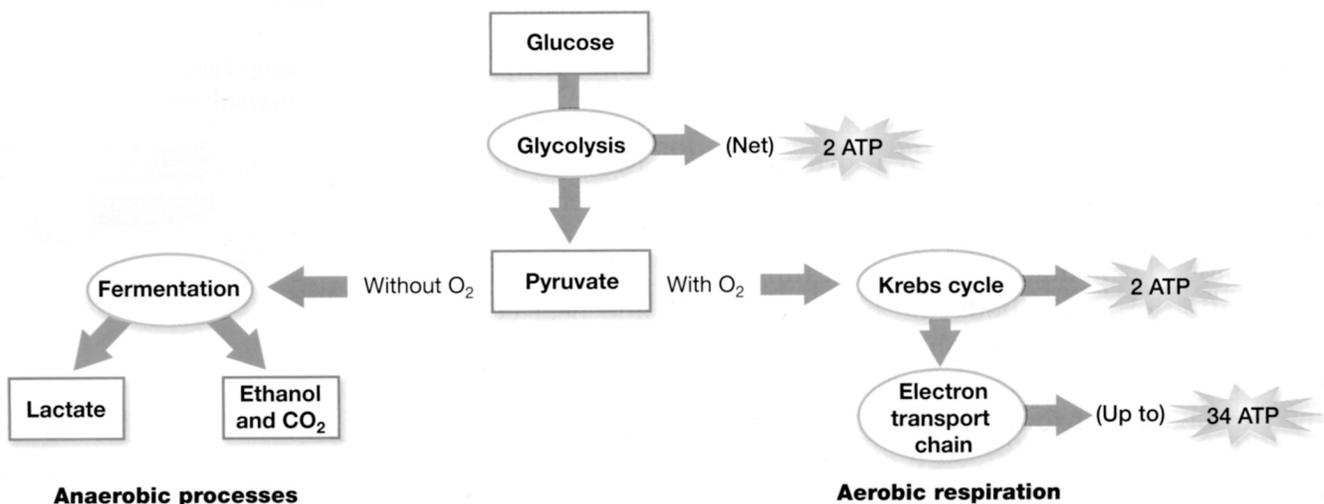
The first major step in cellular respiration is **glycolysis** (see the top of the figure below):



What happens next depends on whether or not oxygen is available to the cells (see the bottom of the figure below). When oxygen is available, cells can use the **Krebs cycle** (citric acid cycle) and the **electron transport chain** to make up to 36 ATPs. This is called **aerobic respiration**.



When oxygen is not available, yeast cells use a process called **fermentation** which does not produce additional ATP, but maintains the conditions needed for continuing glycolysis. Fermentation in yeast cells produces ethanol and  $\text{CO}_2$ . Obviously, fermentation yields much less ATP per glucose molecule than aerobic respiration.



You will be completing a formal lab report for this lab.

1. Question
2. Hypothesis
3. Materials
4. Procedure
5. Analysis
6. Conclusion