Glycolysis, Fermentation, and Cellular Respiration,

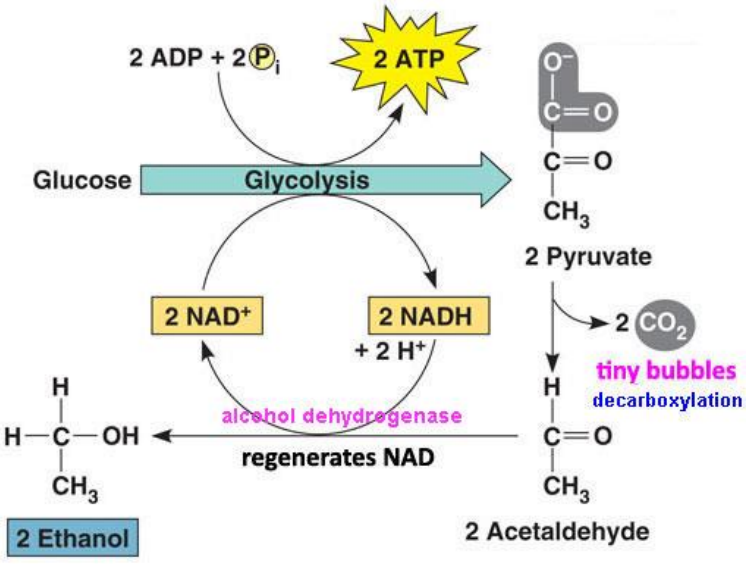
Cellular respiration is the process of oxidizing food molecules, like glucose, to carbon dioxide and water. The energy released is trapped in the form of ATP for use by all the energy-consuming activities of the cell. The process occurs in two phases:

- Glycolysis, the breakdown of glucose to pyruvic acid
- Aerobic Respiration: the complete oxidation of pyruvic acid to carbon dioxide and water

The overall equation for cellular respiration is :

$$C_6H_{12}O_6 + 6\ O_2\ (g) \rightarrow 6\ CO_2\ (g) + 6\ H_2O\ (l)$$

Glycolysis is a metabolic pathway that is found in the cytoplasm of cells in all living organisms and is anaerobic (that is, oxygen is not required). The process converts one molecule of glucose into two molecules of pyruvate, and makes energy in the form of two net molecules of ATP. Four molecules of ATP per glucose are actually produced; however, two are consumed to start the process. When oxygen is not available, some microorganisms, such as yeast, can convert the pyruvate to alcohol and carbon dioxide. This is called anaerobic fermentation and allows microorganisms to regenerate molecules that allow glycolysis to continue (NAD+).



(a) Alcohol fermentation (anaerobically in yeast cells)

Purpose:

Materials:

Procedure:

1. Skip procedures 2 and 3 if instructor has pre-made dough available.
2. Measure out 20 ml of flour. Add 1 gram of sugar. Add 1 gram of dry yeast. Add 5 ml of yeast suspension.
3. Mix your dough thoroughly until it has the consistency of play-dough. Add some more flour if it is too sticky.
4. Pinch off a marble sized piece of dough and roll it into a cylinder shape that is about the same circumference as your test tube.
5. Make sure your dough will fill up about ¼ of the test tube.
6. Roll out your dough so it is narrow enough to fit into your test tube and hit the bottom.
7. Use a pipet to push the rest of your dough to the bottom of your test tube.
8. Make the surface of your dough is as flat as possible.
9. Mark the starting level of dough in each test tube with a sharpie.
10. **Each group** should place one tube in 0^0C, one tube at room temperature (24^0C), one tube in the incubator (37^0C), one tube at 50^0 C, and one tube at 75^0C.
11. Record, in millimeters (mm), the total height the dough rises in each test tube every five minutes for a total of 30 minutes(**Note: always record height from sharpie mark**.).
12. Record your data.
13. Repeat trial 1.
14. Create an analysis graph of your processed data.

Data/Observations:

Table 1: Trial 1 height of dough under temperature conditions (± .5 mm)

Temperature of Yeast	0 Min	5 Min	10 Min	15 Min	20 Min	25 Min	30 Min

Table 2: Trial 2 height of dough under 5 temperature conditions (± .5 mm)

Temperature of Yeast	0 Min	5 Min	10 Min	15 Min	20 Min	25 Min	30 Min

Table 3: Average change in height and standard deviations for trial 1 and 2 of dough under 5 temperature conditions (± .5 mm)

Temperature of Yeast	Average change in Height for trial 1 and 2 **(± .5 mm)**	Standard Deviation for trial 1 and 2 **(± .5 mm)**

Conclusions:

1. What organism caused your dough to rise?_____
2. What gas is being released in the reaction? _____
3. What molecule is broken down to provide the carbon? _____
4. Which temperature worked best for your microorganism?_____
5. Why do you think this temperature worked the best?_____

_____

_____

6. What is the name of the process that breaks glucose into pyruvate?

_____

7. What purpose does this process serve?

_____

_____

8. Where in the cell does this process take place?_____

9. What is the name of the process that turns pyruvate into alcohol?

_____

10. What purpose does this process serve?

_____

_____