# Chemical Reactions that Produce Ethanol Unit 2 Lesson 2

**Fermentation Experiment**

**Purpose** This experiment will test different foods and the amount of fermentation that occurs.

**Fermentation Experiment**

***Ethanol*** is made from a variety of plant substances including corn, sorghum, sugar cane and wood. The process used to make ***ethanol*** is called fermentation. Fermentation was discovered many years ago when bubbles were formed while making wine and beer. Studies by Louis Pasteur described fermentation as changes caused by yeast growing in the absence of air.

Fermentation is an energy yielding process caused by enzymes (provided by yeast) in which fuel molecules such as glucose (sugar) are broken down in the absence of oxygen.

You will test different substances while observing for fermentation (bubbling). State your findings in the space provided.

**Materials:**

8 or more packages of yeast

Ice

Measuring spoons

Flour

Salt

Sugar

Vinegar

Stirrers

Heating element

4 clear glasses

**A. Fermenting Foods**

1. Empty a pkg. of yeast into each half-liter (1 pint) beaker of warm water. Stir for 1 minute.
2. Add 10 ml (2 tsp.) of flour to each beaker and stir again.
3. Add 5 ml (1 tsp.) of salt to the first beaker, 5 ml of sugar to the second beaker, 5 ml of vinegar to the third beaker, and do nothing to the fourth. Stir again.
4. Wait 10 minutes. Record your observations:

Beaker 1 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Beaker 2 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Beaker 3 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Beaker 4 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. Wait 10 more minutes and record your observations:

Beaker 1 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Beaker 2 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Beaker 3 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Beaker 4 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Questions:**

1. What evidence shows that reactions are going on in any of the containers?

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1. How are these observations related to fermentation?

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1. Draw conclusions about which of the substances tested was most helpful to yeast fermentation:

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**B. Changing Temperatures**

1. The second part of this exercise you will observe the effect of different temperatures of water on fermentation. The teacher will prepare boiling water for the first beaker. Fill the second beaker with warm water (just slightly warmer than skin temperature). Fill the third beaker with cold tap water. Fill the fourth beaker with ice water.
2. Empty one packet of yeast into each beaker and stir to dissolve. Add 10 ml of flour and 5 ml of sugar to each jar and stir again.
3. Wait 10 minutes. Record your observations:

Beaker 1\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Beaker 2\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Beaker 3\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Beaker 4\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. Wait 10 more minutes. Record your observations.

Beaker 1\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Beaker 2\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Beaker 3\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Beaker 4\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Questions:**

1. Were there any conditions under which fermentation did not proceed, or went very slowly? What were they? Explain each one.

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2. Draw a conclusion about what temperature is best for yeast-flour-sugar fermentation.

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