

Name: \_\_\_\_\_

Date: \_\_\_\_\_

## Sugar Spill! Activity Yeast Experiment Worksheet – **Answers**



### Purpose

To design a lab that tests what yeast needs in order to eat a lot of sugar.

### Background Information

Bioremediation uses living things to degrade harmful chemicals. Engineers must make sure that the organisms that they want to use for bioremediation have all the things they need to live, so that they will eat up the harmful stuff. There are four basic needs of living things: energy, water, living space and constant internal conditions — or *homeostasis*.

### Testable Question

Fill in the blanks to write a testable question for your yeast experiment. The questions should help you determine what yeast needs in order to eat a lot of sugar.

How does **temperature, amount of sugar, amount of water, addition of vinegar, amount of light** affect how much the yeast eats?

### Hypothesis

Write the hypothesis for your experiment below.

**: If I increase the temperature, then the yeast will eat more sugar because the temperature will help the yeast live.**



### Materials

3 test tubes	9 grams of yeast
3 balloons	Water
9 grams of sugar	

(Note: Add additional materials specific to your experiment; list materials and quantities below.)

**hotplate, thermometer**

### Procedure

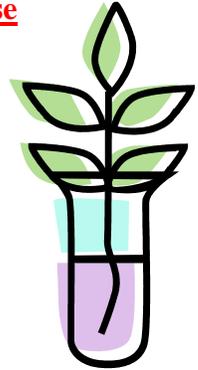
1. Set up a test tube as a control with 3 grams of yeast, 3 grams of sugar and 5 mL of water.
2. Add the yeast and the sugar, and then place a balloon mostly over the opening with just enough room to add the water.
3. Add the water and quickly put the balloon all the way over the opening. (A group member should help you with this part.)

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4. Set up two other test tubes just like the one above but adding an additional ingredient or leaving something out. These are your experimental test tubes. In the space below, explain what your changes will be (based on the testable question you wrote down).

**: If I increase the temperature, then the yeast will eat more sugar because the temperature will help the yeast live.**



5. Watch test tubes carefully as the carbon dioxide bubbles. You may want to mix the ingredients a little so that all the yeast is exposed to the water and the sugar. Record your observations.
6. When the bubbling slows down or stops, measure the diameter of the balloon and record your result in the table below.

### Data Results

Record your observations below:

**Compared to the control, the 90 degree test tube had more froth in the yeast, and the balloon got bigger. The 110 degree test tube did nothing – the balloon did not blow up, and there was no frothy substance**

	Control	Experiment #1	Experiment #2
Diameter of Balloon	<u>Answers will vary</u>		
Radius (= 1/2 of diameter)			
Volume of balloon (equal to $\frac{4}{3} \pi r^3$ )			

### Conclusion

Explain your results above and the conclusion of your experiment.

**I think the yeast in the 110 degree test tube may have died. The yeast seems to eat the most sugar (and live the best) when the test tube is heated slightly, but not too much.**

### Engineering Application

If you were an environmental engineer responsible for cleaning up a sugar spill, how could you use yeast to bioremediate? What would you do to make the yeast work best? (Base your answer on your conclusions.)

**If I were cleaning up a sugar spill, I would design a way to heat up the yeast while it eats away at the sugar. I could do this by waiting for a sunny day, and putting a glass cover over the yeast. The sun would warm up the yeast to a temperature of 90 degrees. If it got too hot, I would take the glass cover off.**