Name _____ Science Course_____

Bread On the Rise

Prelab Thinking and Discussion Questions:

1. All breads are not the same. Make a list of different types of breads.

2. What ingredients are needed to make bread?

Question you are trying to answer.

What is the ingredient that makes bread rise? Can you increase the speed at which bread can rise?

In an experiment you choose ONE thing to change (the independent variable) keeping everything else the same (constants). Then you observe to see what happens (the dependent variable). In this experiment think about what you want to change to see if you can determine what makes bread rise, and whether you can change the speed at which it rises. Here is a list to get you started:

- Amount of water
- Amount of yeast
- Amount of sugar
- Type of sugar (artificial sweeteners, other natural sweeteners (like honey or jelly)
- Temperature of water
- Temperature of dough after mixed

What have you chosen to be your independent variable?

Materials needed:

- Premade dough from your teacher
- Yeast
- Water (warm)
- Sugar
- 12 straws
- Measuring teaspoon
- Permanent Marker/pen
- Tray
- Clay (or clothespins)
- Calculator

Safety Notes:

- Wash hands before and after the lab
- Do not eat the dough
- Food, drinks, and gum are not allowed

Goal: prepare 4 groups of dough, changing only the amount of independent variable in the experimental groups. Your control group should have the least, or none, or your independent variable. For example, if your independent variable is the amount of sugar, your control group would have no sugar, experimental group one would have 1 tsp of sugar, group 2 would have 2 tsp and group 3 would have 3 tsp. See figure 1.

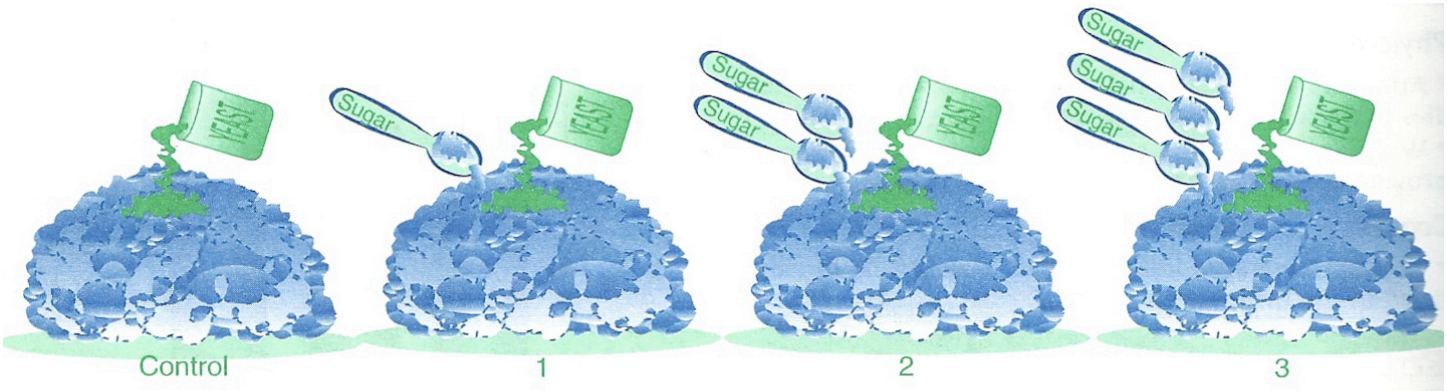


Figure 1. How to set up the flour, yeast, and sugar.

Procedure:

1. Dust your tray and hands with flour.
2. Divide your portion of flour into 4 equal mounds. Designate the mounds as control, Exp. Group 1, 2, and 3.
3. Depending on what you chose as your independent variable, you will add sugar and yeast to each of the groups. ¼ tsp of yeast & 2 tsp of sugar & small amounts of water (a tsp at a time). Complete the second column in Data Table #1 to show the varying amounts of your independent variable.

Data Table #1: Distance dough travels through straw

	Independent Variable		Level of dough after 10 minutes	After 20 minutes	After 30 minutes
Control		Straw 1			
		Straw 2			
		Straw 3			
Experimental Group #1		Straw 1			
		Straw 2			
		Straw 3			
Experimental Group #2		Straw 1			
		Straw 2			
		Straw3			
Experimental group #3		Straw 1			
		Straw 2			
		Straw 3			

4. Work (knead) ¼ tsp of yeast and 2 tsp of sugar along with 1 tsp of warm water into the experimental dough mounds. When mixing your control dough, make sure it has low, or none of the ingredient you are changing for your independent variable. While continuing to keep each mound separate, very slowly add warm water, a tsp at a time to moisten the mixture. Continue to add water and knead by hand until the mounds have doughy consistency. See figure 2. The dough should not stick to the tray or your hands. If it is too sticky, add more flour. Form each into mound of dough into a ball.

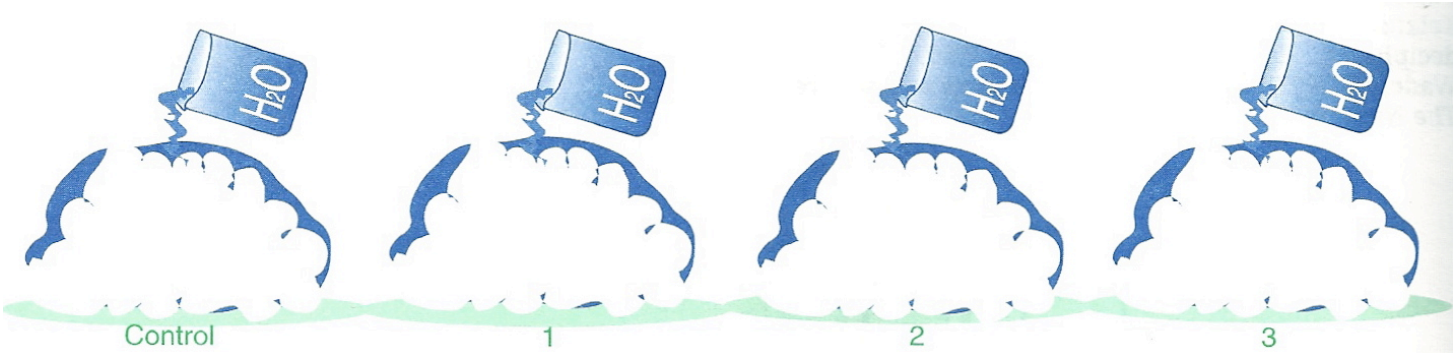
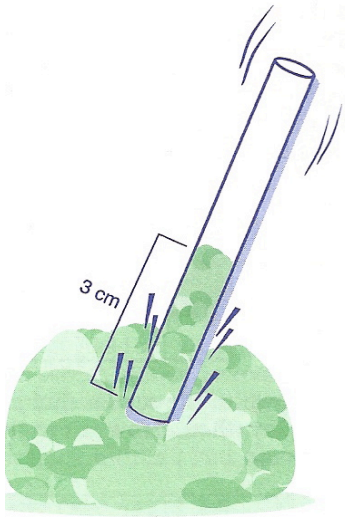


Figure 2. Add water and form into 4 balls of dough.

5. Obtain 12 straws, a pen, and a metric ruler. For all 12 straws, measure and mark 3 cm from the bottom of the straw.
6. Working quickly, push 3 straws into the control dough, filling each with dough to the 3 cm mark. Keep the straws in the dough until all straws have been filled. Repeat the process for dough from experimental groups 1, 2, and 3. See figure 3—the image to the right.
7. Remove the straws from the dough and pinch the ends of the straws to push the dough away from the ends (past the 3 cm line). Find a way to make straws stand up on their own. Either pinch ends with clothespins (see figure 4) or use a ball of clay as stands. Either way, make sure you appropriately label the straw groups as control, Exp. #1, Exp. #2, and Exp. #3. And if the level of the dough was pinched upward past the 3 cm line, make a new mark on the straw and set your timer for 10 minutes. You are waiting for the dough to push upwards through the straw.



While you wait for the first 10 minutes to pass, answer the following questions.

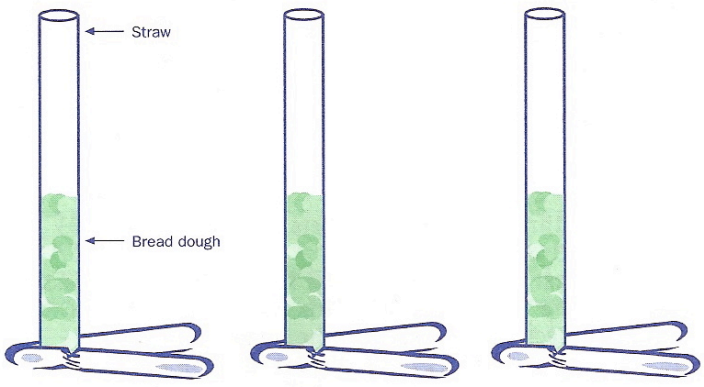


Figure 4. Clothespin straw holder assembly.

Why did we use three straws for each group of dough instead of just one?

What is your prediction?

In which group will the dough rise the most?

In which group will the dough rise the least?

8. After 10 minutes has passed. Reset the timer for another 10 minutes, and begin to take measurements. Use your metric ruler and measure how much the dough has risen above the line for each straw. (If you haven't already, make sure you can identify the difference between staws 1-3 in each group.) Record your raw data into data table 1 on page 2.
9. While waiting for another 10 minutes to pass, calculate the mean for each group. To do this, add the three straw measurements and then divide by 3. Record those calculations in Data Table 2.
10. Begin graphing your results. Construct a graph that will best show your results. Bar, pie, or line?
11. Repeat steps 8-10 to obtain measurements for 20 and 30 minutes.

Data Table #2: Mean distance dough traveled through the straws.

	Mean distance dough traveled through 3 straws after 10 minutes	After 20 minutes	After 30 minutes
Control			
Experimental Group #1			
Experimental Group #2			
Experimental Group #3			

PostLab Questions: After you collected and graphed the data, answer the following questions.

1. Write a paragraph to "talk" about your graph. Which dough group performed the best? Worst? Are there outlier data that don't fit in with the patterns of the rest of the data? Which time group (10, 20, or 30 min) performed the best?

2. What was your prediction correct? Why do you think that is?

3. Were you able to speed up the rising of the dough? Why or why not?

4. Describe any procedural errors that may have impacted the results of this experiment. How could you modify the procedure next time to reduce the chance of errors?

5. From this experiment, have you been able to determine the key ingredient in bread to make it rise? What is it?

6. According to your results, what are the "perfect" conditions for rising bread?

7. What experiments would you still need to perform to better describe the "best conditions" for rising bread?

This lab modified from (and all images are from): Brown, L, C. Mulvihill, J. Stolz, et al. "Meet the Microbes Through the Microbe World Activities." (1999) Reston, National Association of Biology Teachers. pg 62-65.