

What Molecules Make the Holes in Bread?

Items Needed:

container with sugar
container with yeast (use regular yeast, not rapid rise)
test tubes
flashlight
water bath (heated to 50 degrees Celsius)
squeeze bottle with water (inside the water bath)
test tube rack (inside the water bath)
slice of bread in Petri dish
2 scoops
1.5 min timer or stop watch

Notes:

Incubate the yeast and sugar at 50 degrees Celsius for fastest results.
If the yeast is incubated for a longer period of time, a lower temperature can be used.

The Science Behind the Investigation:

A scoop of packaged yeast with a scoop of sugar are mixed in a tube and placed in some warm water. After 2 minutes, bubbles rise from the bottom of the tube as the yeast metabolizes the sugar into carbon dioxide and ethanol. When bread is made the yeast metabolizes the sugars from the flour, and makes carbon dioxide bubbles. These bubbles make the dough rise, and are later seen as the holes in bread.

Related science:

Cakes rises differently. The chemical reaction between the acid and the base in baking powder, or the reaction between baking soda and an acid, also generates carbon dioxide gas.

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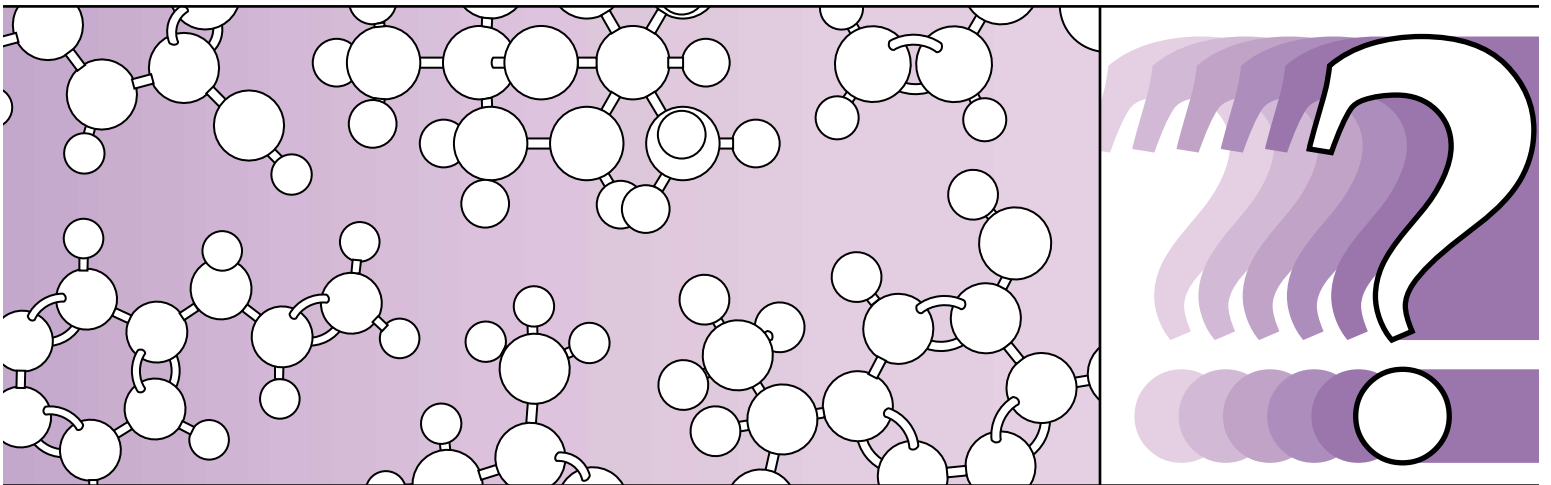
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What molecules make the holes in bread?



Have you ever noticed the holes in bread?

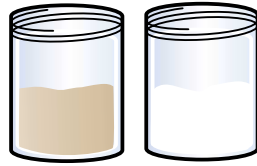
Look at the bread in the box and find the holes in it.

**Find out what molecules
make these holes.**

Molecules are tiny
particles that make
up everything
around us.

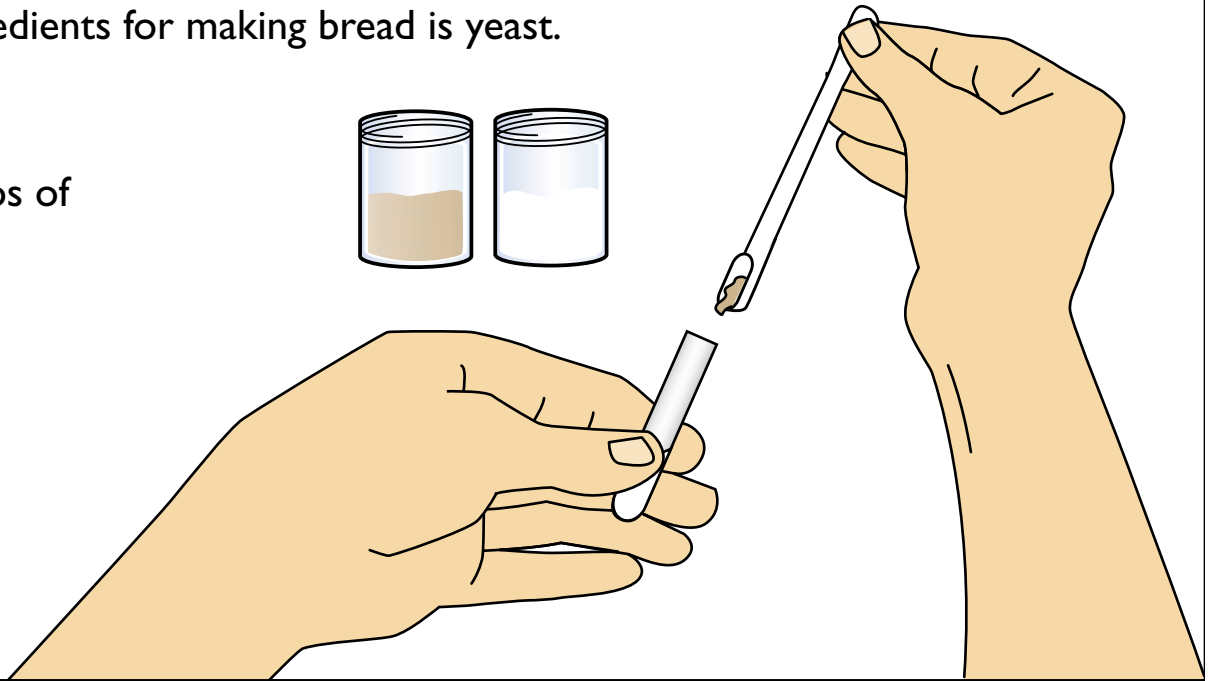
One of the ingredients for making bread is yeast.

Add three scoops of yeast to a tube.



Then add three scoops of sugar.

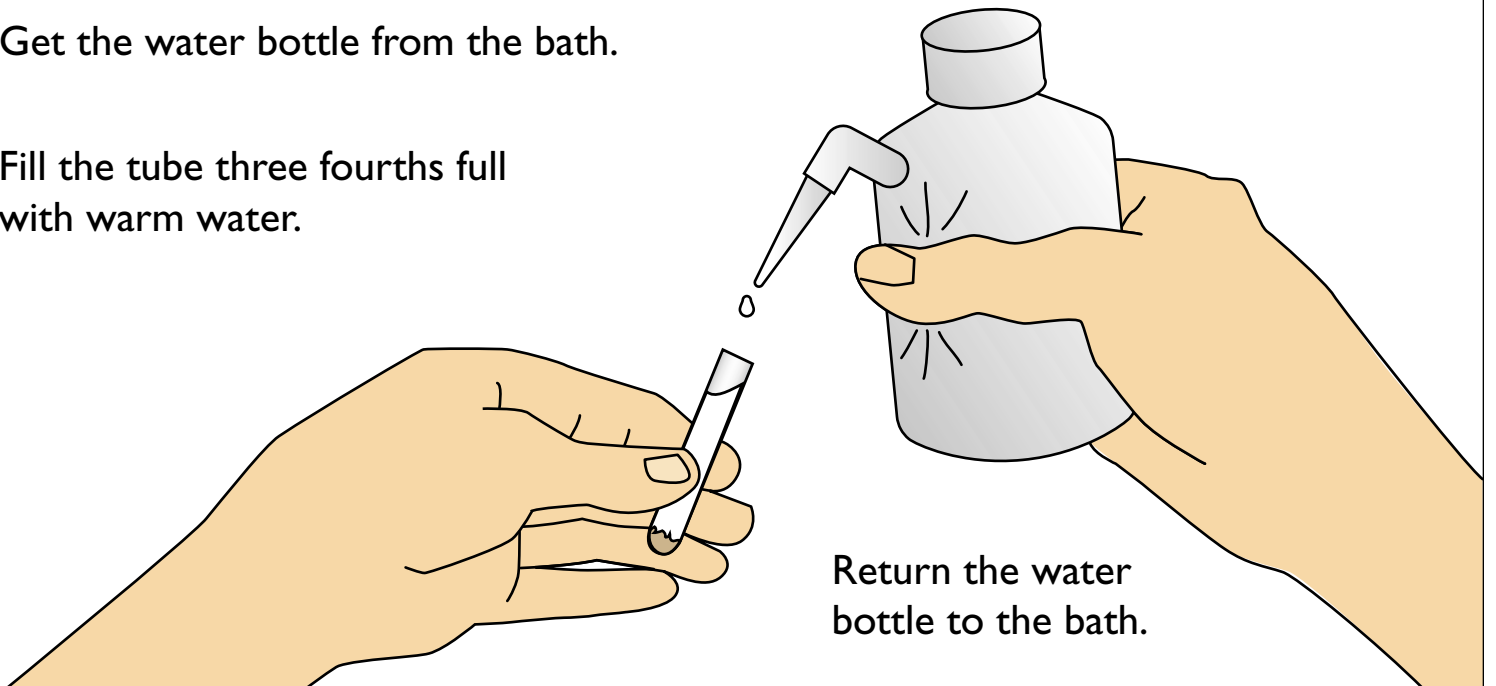
Sugar is food for the yeast.



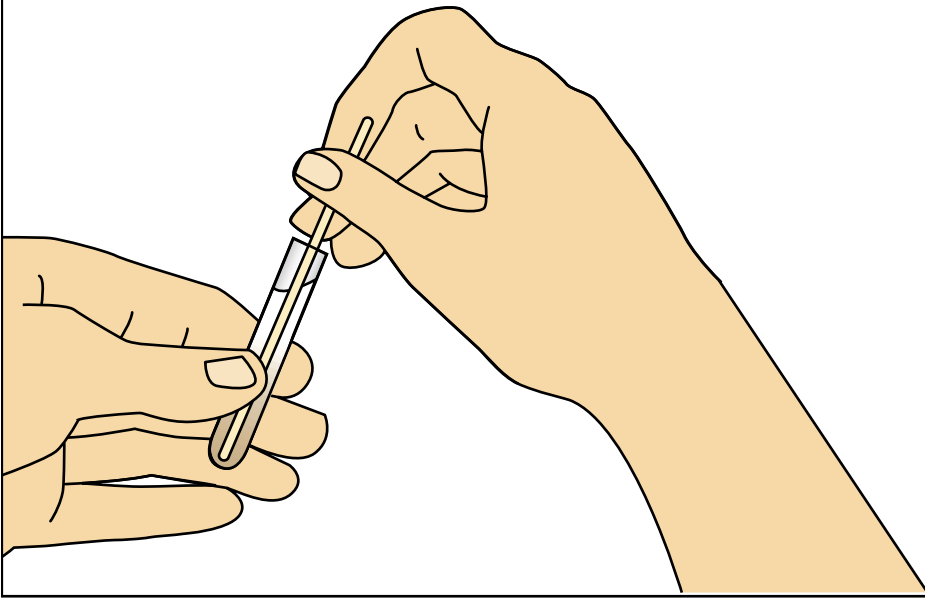
Get the water bottle from the bath.

Fill the tube three fourths full with warm water.

Return the water bottle to the bath.



Use a stick to stir the yeast and sugar into the water.

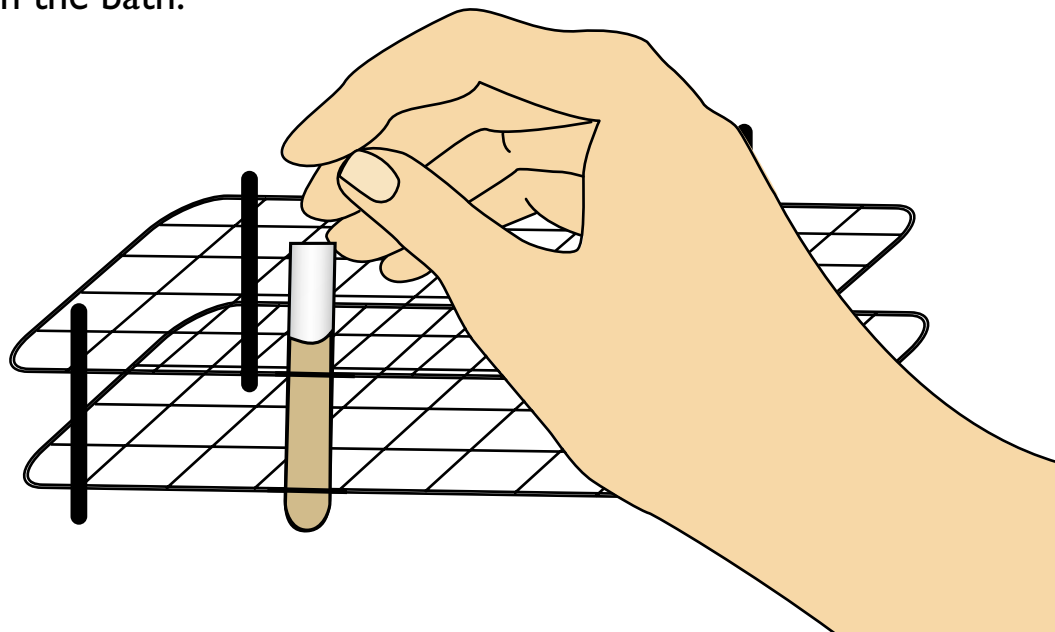


Keep stirring until the water is the same color as the yeast.

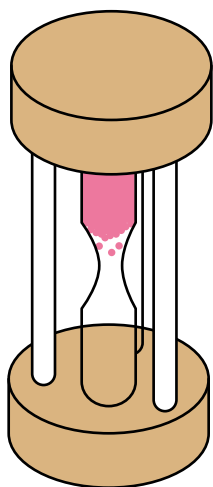
Throw the stick in the trash can.



Put the tube in the rack in the bath.



Start the timer.

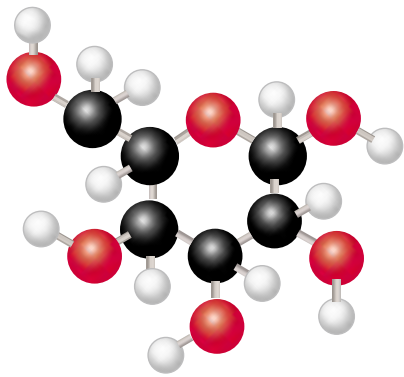


While you wait for the timer, read the next page to find out what is going on in your tube.

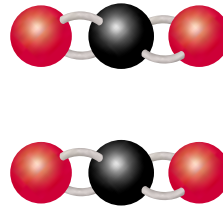
What's going on in the tube?

Yeast is a living thing that feeds on the sugar molecules you put in the tube.

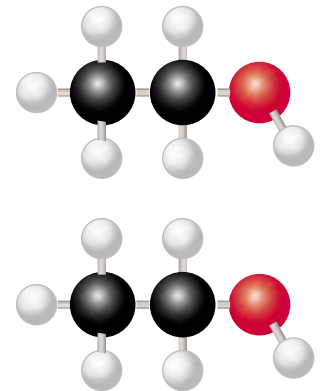
It breaks the sugar molecules apart into carbon dioxide gas molecules and alcohol molecules:



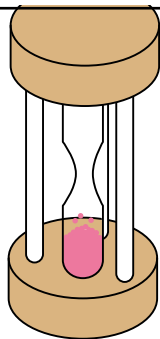
sugar molecule



carbon dioxide gas
molecules

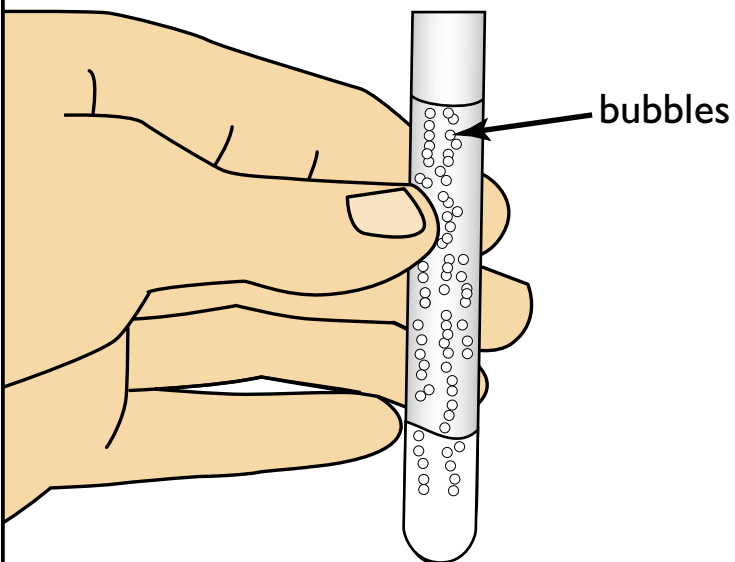
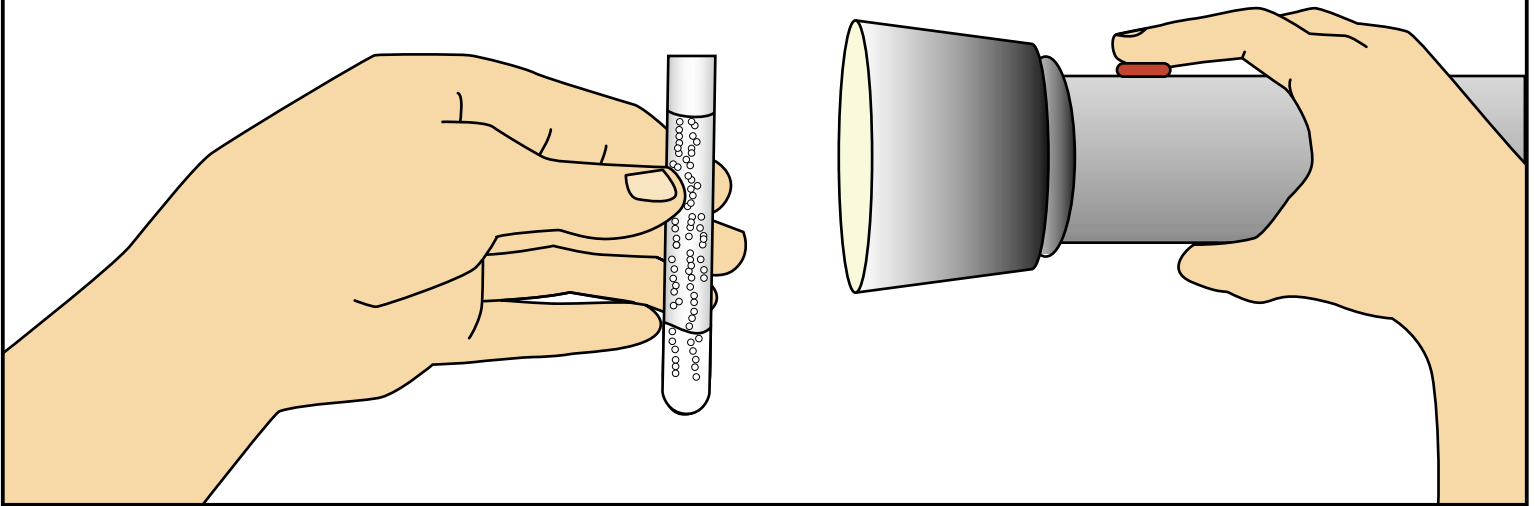


alcohol molecules



When the timer is done,
turn to the next page.

When the timer is done, pick up your tube and shine the flashlight on it from the side.



Look for tiny bubbles streaming up the side of the tube.

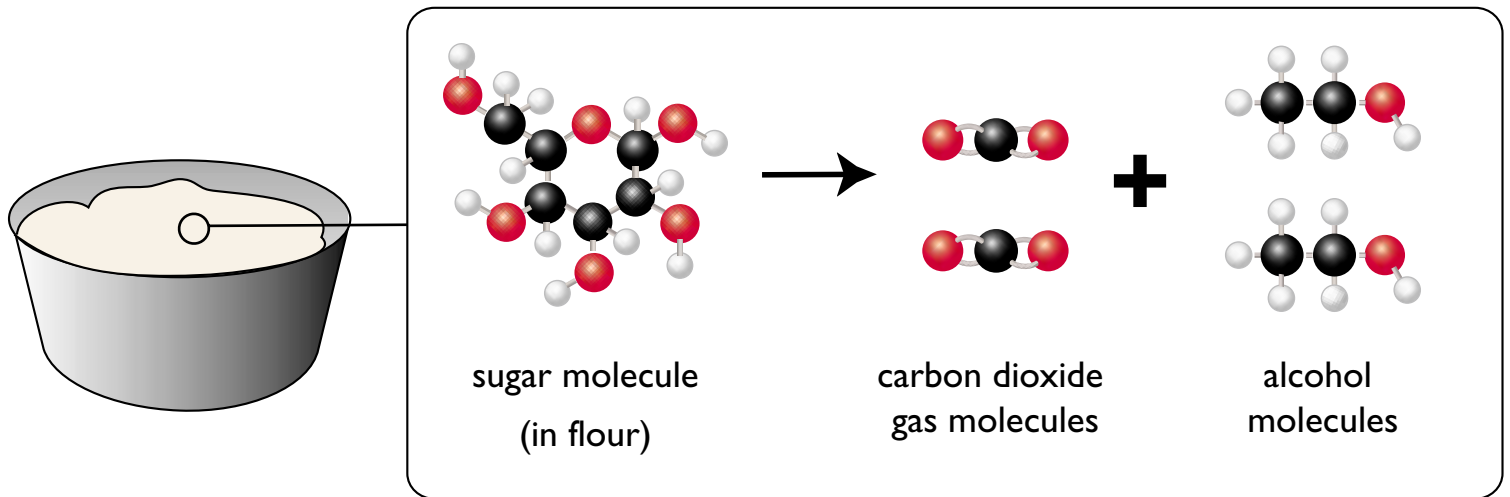
Look carefully — the bubbles are very small.

These are bubbles of carbon dioxide gas, made by the yeast as they eat the sugar.

What about the holes in bread?

The chemical reaction in your tube also happens in bread.

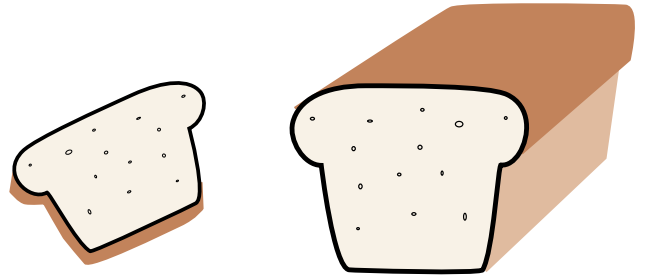
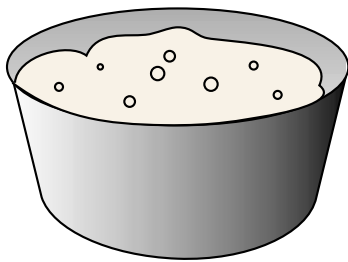
Yeast added to bread dough breaks apart the sugar molecules in flour:



The carbon dioxide gas molecules make bubbles, like they did in your tube.

The carbon dioxide bubbles are trapped in the bread dough ...

... and leave holes when the bread is baked.



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