Use the Words to Know to complete the puzzle below.
Yeast Balloons
Can biochemistry blow up a balloon?

Materials:
- one small clear plastic soda bottle
- warm water
- one package active yeast
- 2 tablespoons sugar

To do and notice:
1. Half fill the bottle with warm water.
   • Why might hot or cold water not work?
2. Add the yeast and sugar to the bottle.
3. Cap the bottle tightly and shake it well.
4. Unicap the bottle and stretch the neck of the balloon over the bottle opening for a tight seal.
5. Sit back and watch. After about 20 minutes you should see the balloon begin to inflate. This process will continue over the course of several hours.
   • Why does the balloon inflate?

A closer look:
Yeast are tiny organisms that like well at warm temperatures. The yeast will die in water that is too hot and will not be active in water that is too cold.

Yeast use sugar as food. In a biochemical reaction called “fermentation,” the yeast breaks down the sugar (C$_{12}$H$_{22}$O$_{11}$) into ethyl alcohol (C$_2$H$_5$OH) and carbon dioxide gas (CO$_2$). The carbon dioxide gas creates the foam and inflates the balloon. Brewers and bakers both use this reaction. Brewers use yeast to create bubbly alcohol. Bakers use yeast to make bread rise.

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Egg Osmosis
A four-day eggsperience!

Materials:
- 2 raw eggs in their shells
- vinegar
- corn syrup
- water

To do and notice:
Days 1-2
Put the eggs in a jar. Cover the eggs with vinegar. Keep the eggs in vinegar for two days. Look for changes on the surface of the egg during the two days. As the egg shell reacts with the vinegar, the reaction produces carbon dioxide gas bubbles.
   • What happens to the shells?
Day 3
Carefully remove each egg from the vinegar. Rinse the eggs and the jars with water. Gently feel the eggs.

Put one egg in each jar. Cover one egg with water and cover the other egg with light corn syrup. Let the eggs sit overnight.

Day 4
Observe both eggs (you can gently pick them up).
   • What are the differences between them?

A closer look:
The membrane around the egg is like a very fine mesh. Small molecules like gases and water can pass through the membrane, but larger molecules like proteins or sugars cannot. When water passes through the membrane, this is called “osmosis.”

Corn syrup is a very concentrated solution of large molecules. When the egg is in corn syrup, water from inside the egg flows out to dilute the corn syrup. The egg shrinks. In water, solution inside the egg is more concentrated than the water outside. The water flows into the egg in an attempt to dilute the white of the egg. This makes the egg swell up to its full size.

CAUTION: Always wash your hands thoroughly with soap after handling raw eggs, which are a common source of salmonella bacteria.

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Cabbage Juice Indicator
Test the pH of household products!

Materials:
- large pot half full of water
- ½ head of RED cabbage
- chopping knife or food processor
- strainer
- strainer
- large bowl
- spoon
- plastic cups
- baking soda
- vinegar

To do and notice:
1. With an adult’s help, heat the pot of water until the water is very hot.
2. With an adult’s help, chop the cabbage with a knife or food processor.
3. Place the cabbage pieces in the pot and cover them with the hot water. Let the cabbage pieces sit for 2 minutes in the hot water.
   • What happens to the color of the water?
4. Place the strainer in the bowl. Pour the cabbage pieces and cabbage juice through the strainer, collecting the juice in the bowl.
5. Use the spoon to put cabbage juice in some plastic cups. Add a few drops of vinegar to one of the cups.
   • What color is the mixture?
6. Add some baking soda to another of the cups.
   • Is the color different?
7. Find other things to add to the cabbage juice. Examples might include milk, lemon juice, soda water, soap, antacids, and aspirin.

A closer look:
Red cabbage contains a chemical that changes its shape depending on whether it is surrounded by an acid or base. When its shape changes, so does its color. The cabbage juice is purple in water (neutral), red in vinegar (acid), and blue-green in baking soda (base).

Some other plants also have chemicals that change color. Try this with flower petals, juices, or berries.