Yeast Metabolism and Temperature

Objective
The purpose of this laboratory is to observe how temperature affects the metabolism of microorganisms by visibly noting the volume changes of identical food mixes containing baking yeast at different temperatures.

Materials
Table sugar, one large glass of icy water (near 32°F or 0.0°C), one large glass of water near body temperature (near 98.6°F or 37°C), two 100 ml graduated cylinders, one thermometer, ¼ teaspoon measuring device, small bowl of table sugar (sucrose), one packet of active dry yeast (Baker’s yeast *Saccharomyces cerevisiae*), paper towels. Room temperature should be comfortable (near 68°F to 78°F). Pen, color pencils, paper, camera if available.

Setup Diagram
(Color Picture with labels. If drawn use three distinctly different colors please.)

![Setup Diagram](image-url)

Procedures (Steps needed to perform lab in a repeatable manner.)
1. Gather materials needed.
2. Fill glass with ice and water let stand until stable icy temperature is reached.
3. Fill glass with hot water and then add cold water until near body temperature is reached and remains stable.
4. Stand two 100ml graduated cylinders next to each other.
5. Add one teaspoon of table sugar to each 100ml-graduated cylinder.
6. Add three quarter-teaspoons of active dry yeast to each 100ml-graduated cylinder.
7. Setup timer for zero time.
8. Add 50ml to 60ml of icy liquid water to one graduated cylinder.
9. Add 50ml to 60ml of body temperature water to the other graduated cylinder.
10. Cap each cylinder with palm of hand and shake vigorously to mix sugar, water and yeast.
11. Start timer.
12. Mark or set cylinders so that one can tell which is the icy one and which is the body temp cylinder. One can touch the cylinders and easily tell which is which.
13. Expose temperature probe to room air to note ambient room temperature.
14. Let experiment run for 20 minutes and visually note the changes in the cylinders.
15. Note observations with pictures, color illustrations, etcetera.
16. Clean up after yourself. I am not your mother.

**Data** (Color pictures or drawings)

Ready to start setup.

Zero time, sugar water and yeast mixed by shaking.
Experiment at 8 minutes. Note the yeast activity and room temperature.

Experiment at 15 minutes. Note the yeast activity and room temperature.
Experiment at 20 minutes. Note the yeast activity and room temperature.

**Conclusion** (Conclusion should address the experiment’s objective/purpose and be at least one paragraph in size.)
Exempla gratia, e.g. The volume of the cold mix changed little while at the same time the volume of the warm mix nearly doubled. The volume change indicates that the yeast in the warm mix were more active than the yeast in the cold mix. I believe, from the above macroscopic observations that the metabolism of yeast, which is an eucaryotic microorganism, is greater at body temperature than at icy temperature.

**Out of class work:** Students need to write-up the laboratory using the format and order above. Their paper must have: a title, an objective (that is one or two sentence long), a material list, a setup diagram (picture/drawing in color, about 1/3 page or more in size with labels), numbered procedure steps, a data list/table (may be drawn or written), and a conclusion that is at least one paragraph long.