Name _____ Date _____ Period _____

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# Weighing the Invisible: A Yeast Respiration Lab

Biology

Work with your group. Record every measurement with its unit. Answer questions in complete sentences.

**Draft lab.** This lab has not been tested in a classroom yet. Your teacher may change some steps, times or amounts.

## The Puzzle

A bottle of warm, sweet water with yeast sits on a balance. Nothing spills and nothing is taken out, yet the reading slowly goes down. Where is the mass going? In this lab you will "weigh" the gas that yeast releases and test which sweeteners yeast can actually use.

## Question

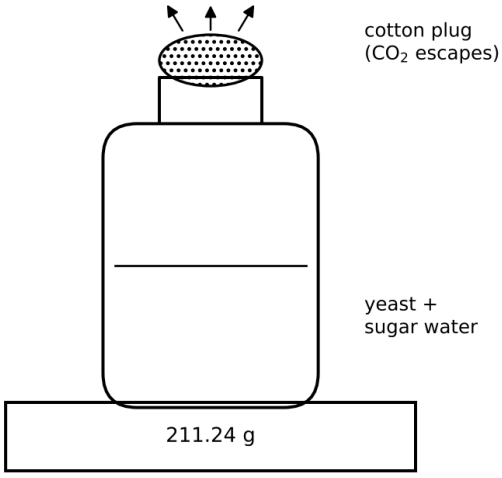
Which sweeteners can yeast use for energy, and how much mass does the bottle lose as they do?

## Safety

- Wear goggles. Use warm water only (35 to 40 °C), never hot.
- Do not taste anything. Wipe up spills, especially near the balance.

## Materials (per group)

- 3 small plastic bottles (about 250 mL), each with a loose cotton plug
- Packet of dry yeast (use 3 g per bottle)
- Table sugar and one test sweetener from your teacher (5 g each)
- Warm water (35 to 40 °C), graduated cylinder, balance (0.01 g), timer




*The cotton plug lets gas out but stops splashes.*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## Before the Lab

**1.** Predict which bottles will lose the most mass. Explain what you think the yeast is doing.

## Procedure

**1.** Label the bottles S (table sugar), T (test sweetener), and N (no sugar).

**2.** Add 5 g of table sugar to S and 5 g of your test sweetener to T. Add nothing to N.

**3.** Add 100 mL of warm water to each bottle and swirl until dissolved.

**4.** Add 3 g of yeast to each bottle, swirl, and push in the cotton plug. Do this quickly for all three.

**5.** Weigh each bottle right away (0 min), then every 10 minutes for 30 minutes. Swirl gently before each weighing.

## Data

**Table 1. Bottle mass**

| Bottle | 0 min (g) | 10 min (g) | 20 min (g) | 30 min (g) | Mass lost (g) | Corrected (g) |
|---|---|---|---|---|---|---|
| S: table sugar | | | | | | |
| T: _____ | | | | | | |
| N: no sugar | | | | | | |

Your teacher will post the mass lost by a bottle with sugar and water but no yeast (evaporation only). Corrected = mass lost - evaporation.

**Table 2. Class data**

| Sweetener | Table sugar | Corn syrup | Honey | Lactose (milk sugar) | Erythritol | No sugar |
|---|---|---|---|---|---|---|
| Class average corrected loss (g) | | | | | | |

## Analysis

**2.** The bottle lost mass, but nothing visible left it. What left, and what process made it?

**3.** Why do we subtract the evaporation bottle's loss?

**4.** In fermentation, 180 g of glucose releases 88 g of $CO_2$. Use your corrected table sugar loss to estimate how many grams of sugar the yeast used. Show your setup.


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**5.** Which sweeteners did the yeast not use? Suggest why.

**6.** Atoms are conserved. Where did the atoms in the missing mass come from, and where are they now?

**7.** Claim, evidence, reasoning: Is the mass lost by the bottle evidence that yeast are carrying out cellular respiration?

| **Claim** |
| --- |
| |

| **Evidence** |
| --- |
| |

| **Reasoning** |
| --- |
| |


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