

Yeast Balloon STEM Lab

Sugar % vs CO₂ Production

Scientific Method • Variables • Data & Graphing

- ✓ **Classroom-Ready**
- ✓ **Data tables + Templates Included**



Yeast Balloon STEM Investigation: Sugar % vs CO₂ Production

Teacher Reference

Purpose

Students test how sugar concentration (%) affects CO₂ production by baker's yeast, using balloon circumference (cm) as a proxy for gas volume.

Safety

Use food-safe yeast and table sugar only.
Warm—not hot—water (35–40 C). Do not taste materials.
Wipe spills; release balloon gas away from faces and flames.

Materials (per team)

Five identical small bottles (250–500 mL)
Five identical balloons (same brand/size), pre-stretched twice
Active dry yeast (2.5 g per bottle)
Sugar solutions: 0%, 1%, 3%, 5%, 10% (w/v), 100 mL each, at 35–40 C
Thermometer; 100 mL graduated cylinder; funnel; labels/marker
String plus ruler or flexible tape measure; timer

Controls to Keep the Test Fair

Same bottle type and 100 mL solution volume.
Same yeast mass (2.5 g) sprinkled last; same 5 s swirl.
Same solution temperature at start (35–40 C).
Same balloon brand, pre-stretched the same way.
Same timing window (measure at 20 minutes) and room temperature.
Bottles undisturbed and upright; balloons vertical.

Background

Yeast ferments sugar with very high efficiency.

Answer Key

Sample average

Sugar %
0
1
3
5
10

Interpretation

Peak CO₂ production is minimal; 10

Model Results

1. Highest
2. Pattern
3. Key concepts
4. Next: to enzyme



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Driving Question

Students test how sugar concentration (%) affects CO₂ production by baker's yeast, using balloon circumference (cm) as a proxy for gas volume.

Hypothesis

Predict which sugar % will produce the largest balloon circumference and why.

Variables

Type	Describe for This Experiment
Independent Variable (IV)	Sugar concentration: 0%, 1%, 3%, 5%, 10% (w/v)
Dependent Variable (DV)	Balloon circumference (cm) at 20 minutes
Controlled Variables	Bottle type, solution volume (100 mL), yeast mass (2.5 g), solution temperature (35–40 C), balloon type, pre-stretching, timing window, mixing method, room temperature

Procedure (3 trials per sugar %)

1. Label five bottles: 0%, 1%, 3%, 5%, 10%. Add 100 mL of the matching warm solution to each.
2. Add 2.5 g of yeast to each bottle. Swirl gently for 5 seconds to wet the yeast.
3. Immediately stretch a balloon over each bottle mouth. Start the timer.
4. Leave bottles undisturbed. After 20 minutes, wrap string around the widest part of each balloon, mark and measure the string with a ruler. Record circumference (cm).
5. Repeat for a total of three trials per sugar level and compute averages.

Raw Data Table (enter data)

Sugar %	Trials
0	
1	
3	
5	
10	

Summary Table

Sugar %	Average
0	
1	
3	
5	
10	

Rubric (24 points)

Category	4 — Exceeds	3 — Meets	2 — Approaches	1 — Beginning	0 — Not Evident
Experimental Design & Fidelity	All controls followed; solutions mixed accurately; temps verified; timing consistent; balloons pre-stretched.	Minor slips but fair test preserved.	Several inconsistencies affecting fairness.	Major inconsistencies; not repeatable.	Not attempted/unsafe.
Variables & Controls	IV, DV, and key controls correctly stated and maintained.	IV/DV correct; most controls applied.	IV/DV partly correct; several controls missing.	Variables unclear; controls absent.	Not addressed.
Data Quality & Recording	3 trials per %; neat entries; averages computed; anomalies noted.	All % tested; minor omissions/messiness.	One level missing or inconsistent units.	Two+ levels missing; data unreliable.	No usable data.
Graphing & Communication	Correct bar graph with title/labels; accurate bars; best % identified.	Graph present with minor issues.	Graph present but missing key elements.	Incorrect graph or major errors.	No graph.
Claim—Evidence—Reasoning	Clear claim naming best %; cites data; explains enzyme/osmotic effects.	Claim with data and partial reasoning.	Claim or data present; reasoning generic/weak.	Vague claim with no evidence.	No CER.
Collaboration & Safety	Roles shared; safe handling; cleanup complete.	Mostly safe/organized; occasional reminders.	Uneven participation; repeated reminders.	Off-task or unsafe behaviors.	Unsafe/removed.

What You Get

- **Student Packet:** clear, step-by-step setup and measurement procedures plus raw data tables for 5 sugar levels (0%, 1%, 3%, 5%, 10%) with 3 trials per level.
- **Summary & Graphing Pages:** average-by-percentage table and graph template (Average Balloon Circumference vs Sugar %) with included graph paper and a circumference-to-volume conversion tip.
- **Analysis & Analysis Answers:** four prompts with sample class data and graph as well as analysis question key.
- **Rubric:** 24-point rubric for easy grading across design, data quality, graphing, CER, and collaboration.