Yeast and dough expansion

Student activity • practical and reasoning

YEAR 10 / LESSON 23 / BIOLOGY + SCIENCE (DOUBLE AWARD)

The question

How does temperature affect dough expansion over a fixed interval?

Compare matched dough portions at three temperatures, recording actual expansion and a no-yeast control.

Equipment

- Standard teacher-prepared dough and no-yeast control
- Graduated vessels with spare headroom, timer and thermometer
- Access to 20, 30 and 37 °C stations; booklet and graph paper

Do not eat classroom dough. Check wheat/gluten and yeast sensitivities; avoid flour dust. Clean spills promptly and keep vessels unsealed so pressure cannot build. Wash hands and benches after handling dough.

Course coverage: Shared Biology / Double Award: 5.5–5.6. Yeast in food production and changing conditions.

Plan, model or apparatus sketch

Draw and label the apparatus or biological model; identify one limitation.

Method and reasoning

Read the whole sequence before starting

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1. Use the teacher-supplied standard dough with a known baker’s yeast batch. Place an equal measured portion in a lightly marked measuring vessel; record initial volume.

2. Place the vessel at the assigned 20, 30 or 37 °C station. Keep recipe, initial dough amount, vessel shape and mixing procedure constant; record actual temperature.

3. Record dough volume every five minutes for 30 minutes without compressing it. Keep the vessel open or loosely covered; never seal expanding dough in a rigid closed vessel.

4. Observe a matched no-yeast dough control at the same temperature. Pool independent class repeats rather than inventing repeat readings from one vessel.

5. Calculate volume increase and compare expansion over the same time interval. Plot volume against time, keeping individual traces or showing repeat spread.

6. Explain carbon dioxide production by yeast fermentation and why expansion also depends on gas retention by dough. State why this measurement alone cannot prove that all respiration was anaerobic.

Cleanup

- Place dough in the designated solid-waste container, not the sink.
- Wash equipment as directed and clean hands and work surfaces.

Record your evidence

Blank spaces are for your own work

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Reference and task data

Yeast fermentation converts sugar to ethanol and carbon dioxide. Gas retained in the dough contributes to expansion; dough structure, mixing and gas loss also affect volume. Early oxygen availability is not eliminated by this open setup. This is a food-production model, not a direct measurement of pure anaerobic respiration rate.

Time / min	Dough volume / cm^3	Control volume / cm^3
0		
5		
10		
15		
20		
25		
30		

Show your calculations, labelled model or correction here.

Explain and evaluate

Use evidence and show calculation steps where relevant

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1. Which organism is used?

2. Which product contributes to rising dough?

3. Name three controls.

4. Why include no-yeast dough?

5. Calculate the increase from 40 to 58 cm^3.

6. Why is dough expansion not identical to carbon dioxide production?