Fermentation: conditions and evidence

Student activity • practical and reasoning

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The question

What can gas production tell us about yeast fermentation?

Set up a small warm glucose–yeast fermentation with a vented airlock. Record actual change and evaluate why carbon dioxide alone does not prove ethanol identity.

Equipment

- Eye protection, 100 cm^3 flask, measuring cylinder, balance and thermometer
- 5.0 g glucose, 1.0 g dried yeast and 50 cm^3 water per group
- Staff-checked fermentation airlock, tray and water bath near 30 °C

Wear eye protection; no tasting, flames or sealed vessels. Keep the gas vent clear and follow the teacher's labelled storage/disposal plan.

Course coverage: Chemistry only: 4.32C–4.33C. Fermentation setup and observation; no distillation, tasting or chromium(VI) test.

Plan, model or apparatus sketch

Draw the flask, liquid/headspace, venting airlock and warm bath. Show gas escape without an open air inlet.

Method and reasoning

Read the whole sequence before starting

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1. Wear eye protection. Dissolve 5.0 g glucose in 50 cm^3 water at about 30 °C in the flask. Record the actual temperature.

2. Add 1.0 g yeast and swirl gently. Fit the teacher-checked airlock that lets gas escape; never use a plain sealed stopper.

3. Label and place in the approximately 30 °C bath/tray as directed. Keep air entry restricted while preserving a clear gas escape route.

4. Record appearance and airlock activity at stated times during class; continue later observations only under the teacher's storage plan. Do not invent bubbles if none are seen.

5. Compare with a teacher-prepared no-yeast control. Explain why equal glucose, water and temperature improve the comparison.

6. Write $C_6H_{12}O_6 \rightarrow 2C_2H_5OH + 2CO_2$. Explain that bubbles are gas evidence, not proof of ethanol, and identify a suitable separately approved analytical follow-up.

Cleanup

• Leave labelled vessels only in the designated tray. Staff dispose of cultures under the school procedure; wash equipment and hands.

Record your evidence

Blank spaces are for your own work

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Reference and task data

Use actual observations. Fermentation is favoured by warm conditions near 30 °C and restricted oxygen; excessive heat can denature enzymes, while low temperature slows activity. The airlock vents CO_2 and limits incoming air. Bubbles may not appear within one lesson and do not establish ethanol identity.

Time / temperature	Yeast setup	No-yeast control
Start		
10 / 20 / 30 min		
Later agreed time		

Show your calculations, labelled model or correction here.

Explain and evaluate

Use evidence and show calculation steps where relevant

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1. Balance the fermentation equation.

2. Why is yeast used?

3. Why avoid excessive temperature?

4. Why restrict air but allow gas to escape?

5. What does the no-yeast control test?

6. Why are bubbles insufficient proof of ethanol?