Investigate Cells and Sugar

Test a sugar input, then explain matter and energy.

BIO.5 "Plan and carry out investigations and utilize results to explain the role and cycling of products and reactants involved in the cellular conversion of energy. a..."

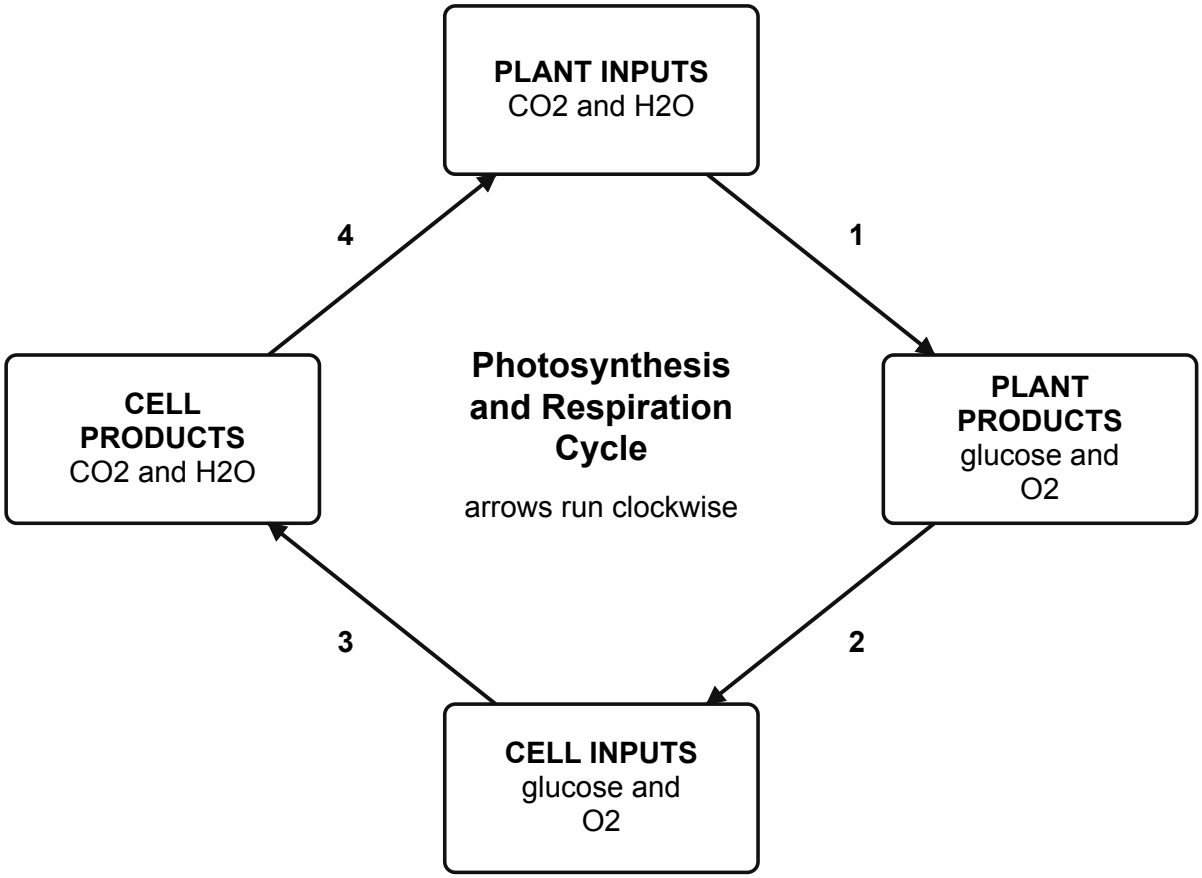
NAME _____ DATE _____

1 LABEL THE MODEL

Word bank below

Label the cycle arrows. Then work in a group with teacher supervision: obtain two matching open clear cups, active dry yeast, sugar, warm water, teaspoons, a ruler, a graduated measuring cup and a timer. Do not taste mixtures. Keep cups open; do not seal gas-producing mixtures.

WORD BANK aerobic respiration | movement to cells | photosynthesis | uptake by plants



Arrow numbers match the response boxes on the next student section.

Label the arrows

Use the word bank to write the process for each numbered arrow.

Arrow 1	Arrow 2

Arrow 3	Arrow 4

2 RUN THE MODEL

Use your finished diagram

1. Plan: compare yeast with and without added sugar. Use 50 mL warm water and 1 teaspoon yeast per cup; add 1 teaspoon sugar to only one. Predict the result. Choose equal observation times and explain two conditions to keep constant.

2. Carry out your approved plan. Record foam height in mm for each cup at the start and at two later times on separate paper. Compare the changes. Report your observations even if they differ from your prediction.

3. Yeast can convert sugar to ethanol and CO2 by fermentation while making ATP. Use your results to explain a possible fate of sugar matter and energy. How could plants reuse released CO2? Does foam alone prove fermentation or measure ATP?

3 CHECK IT

Before you turn it in

- [ ] I planned and carried out a comparison.
- [ ] I recorded actual observations with units.
- [ ] I distinguished evidence from an inference.

TEST THE MODEL

How does our open-cup yeast test differ from the aerobic-respiration cycle shown? Name one measurement needed to strengthen a conclusion.

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PART 1 · COMPLETED MODEL

ARROW	FROM	TO	PROCESS
1	PLANT INPUTS CO2 and H2O	PLANT PRODUCTS glucose and O2	photosynthesis
2	PLANT PRODUCTS glucose and O2	CELL INPUTS glucose and O2	movement to cells
3	CELL INPUTS glucose and O2	CELL PRODUCTS CO2 and H2O	aerobic respiration
4	CELL PRODUCTS CO2 and H2O	PLANT INPUTS CO2 and H2O	uptake by plants

PART 2 · RUN THE MODEL

1. **Accept a testable prediction and equal times, temperature, water, yeast and cup size. Added sugar is the changed variable; the no-added-sugar cup is the comparison.** (Plan: compare yeast with and without added sugar. Use 50 mL warm water and 1 teaspoon yeast per cup; add 1 teaspoon sugar to only one. Predict the result. Choose equal observation times and explain two conditions to keep constant.)
2. **Require actual time-labelled measurements for both cups, units and a comparison. Sugar commonly increases gas/foam, but accept honest observations and explanations of weak or unexpected results; do not require invented values.** (Carry out your approved plan. Record foam height in mm for each cup at the start and at two later times on separate paper. Compare the changes. Report your observations even if they differ from your prediction.)
3. **Sugar atoms can enter ethanol and CO2; some sugar energy is transferred to ATP and some dissipates as heat. Plants can incorporate CO2 carbon into sugars by photosynthesis. Foam is indirect evidence of gas production, not a CO2 identification, ATP measurement or proof that fermentation rather than aerobic respiration occurred.** (Yeast can convert sugar to ethanol and CO2 by fermentation while making ATP. Use your results to explain a possible fate of sugar matter and energy. How could plants reuse released CO2? Does foam alone prove fermentation or measure ATP?)

TEST THE MODEL (SAMPLE ANSWERS)

- The diagram shows aerobic respiration, but yeast can also ferment; an oxygen measurement would help characterize conditions.
- Foam is an indirect gas indicator; testing the gas could establish whether it is CO2.

Teacher: provide warm, not hot, water and supervise mixing. Students choose matched times (for example 0, 5 and 10 minutes) before starting. Use separate paper for the plan/data table. The investigation targets part of BIO.5, not all lipid or anaerobic pathways. Breaking bonds alone requires energy; net energy release reflects the whole reaction. Diagram arrows remain photosynthesis, movement to cells, aerobic respiration and uptake by plants.