Digestion and a model gut membrane

Student activity • practical and reasoning

YEAR 10 / LESSON 53 / BIOLOGY + SCIENCE (DOUBLE AWARD)

The question

What can an artificial membrane show about absorption, and what can it not show about digestion?

Observe movement through a non-living membrane, then explain which digestive processes the model leaves out.

Equipment

- Staff-prepared dialysis bag, labelled water vessel and timer
- Separate pipettes, spotting tile and iodine
- Access to supervised Benedict’s tests with known controls

Wear eye protection and do not taste any solutions. Staff prepare tubing and manage the electric hot-water bath; tubes remain open and point away from people. Use holders for hot tubes. Keep copper-containing Benedict’s waste in a labelled collection container and wash hands after the activity.

Course coverage: Shared Biology / Double Award: 2.17 and 2.29. Non-living membrane model and digestive enzymes.

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. Label a staff-prepared dialysis bag containing 5 cm^3 of 1% starch suspension and 5 cm^3 of 1% glucose solution. Ensure its outside has been rinsed thoroughly before it is placed in 30 cm^3 clean water.

2. Take separate labelled outside-water samples at the start and after 20 minutes, keeping the bag intact. Record room temperature and actual times.

3. Test drops of each sample with iodine on a spotting tile. Compare with known starch and water controls.

4. Use the teacher's supervised Benedict's station to compare reducing-sugar tests of the samples, original bag mixture, glucose control and water control. Keep samples and pipettes separate.

5. Record actual colours. Explain any change outside the bag using diffusion, and consider leaks or contamination if starch appears outside.

6. Explain the missing digestion stage using enzyme pathways: amylase starch to maltose, maltase maltose to glucose; proteases proteins to amino acids; lipases lipids to fatty acids and glycerol.

Cleanup

- Collect Benedict's-containing liquids in the labelled copper-waste container.
- Dispose of tubing and other reagents as directed; rinse equipment and wash hands.

Record your evidence

Blank spaces are for your own work

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Reference and task data

This bag begins with glucose already present and contains no digestive enzyme: it models selective permeability, not starch digestion. Benedict's detects reducing sugars, not glucose uniquely. A real intestinal wall has living cells, transport proteins, villi and blood flow absent from the bag.

Sample	Iodine colour	Benedict's colour	Interpretation
Outside start			
Outside 20 min			
Original mixture			
Known positive			
Water negative			

Show your calculations, labelled model or correction here.

Explain and evaluate

Use evidence and show calculation steps where relevant

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1. Why rinse the bag outside?

2. What does iodine test for?

3. What does Benedict’s detect?

4. Does this setup prove amylase made glucose?

5. Give the amylase/maltase sequence.

6. Give two model limitations.