What's for Lunch?

The process of cellular respiration may be complex, but it is actually fairly simple to study. One of the products of cellular respiration is carbon dioxide gas, so if cellular respiration is taking place, one should be able to collect it in a sealed environment.

Yeast is an example of an organism that converts sugars into carbon dioxide via the process of cellular respiration. Yeast is particularly effective at this task, so much so that it is often used as an ingredient in baked goods. The carbon dioxide produced by the yeast makes dough rise.

In this lab, yeast will be used to determine specific conditions that are required for cellular respiration.

Skills Reference 2

Skills You Will Use

- Using appropriate equipment and tools
- Drawing conclusions

Safety

Caution

You will use beakers and test tubes in this activity. Take care when handling glassware.

Question

What raw materials and conditions are involved in cellular respiration?

Materials and Equipment

- felt marking pen
- five plastic straws
- beaker
- graduated cylinder
- 5 narrow-necked plastic bottles
- 5 round balloons
- sugar
- salt
- dry powdered yeast
- warm water (between 40 and 45 degrees Celcius)

Procedure

1. Create an appropriate data table in your notebook. The table should columns labeled "bottle", "contents", "predictions", and "observations".

2. Gently stretch each of the 5 balloons so that they will inflate easily.

3. Use the felt pen to label the 5 bottles A through E.

4. Use a beaker to fill each bottle with the same amount of warm water.

5. Put 5ml of salt in to bottle B.

6. Put 5ml of sugar into bottles C and E.

7. Put 30ml of sugar into bottle D.

8. Put 2ml of powdered yeast into bottle A. Stir the mixture with a clean straw. Remove the straw and discard it.

9. Immediately place a balloon over the opening of bottle A. Make sure the balloon fits tightly around the neck of the bottle.

10. Repeat steps 8 and 9 for bottles B, C, and D.

11. Place a balloon over bottle E without adding yeast to the bottle.

Analyzing and Interpreting

12. Place the 5 bottles in a warm spot away from drafts. Observe and record what happens. Explain why the balloon changed size in some bottles, and not in others. What caused that change in size?

Forming Conclusions

13. A student performing the procedure steps 1 through 12 collected the following results.

Bottle	Contents	Observations
A	Yeast alone	Balloon did not inflate
B	Yeast and 5ml of salt	Balloon did not inflate
C	Yeast and 5ml of sugar	Balloon inflated a moderate amount
D	Yeast and 30ml of sugar	Balloon inflated a large amount
E	No yeast and 5ml of sugar	Balloon did not inflate

Based on these results, what is your conclusion regarding the requirements for cellular respiration?

14. A student designs an experiment similar to procedure steps 1 through 11, but sets up the whole apparatus twice, and places one set of bottles in bright light and the other set of bottles in dim light. What would you expect for the results of this experiment?

15. A student designs an experiment similar to procedure steps 1 through 11, but sets up the whole apparatus twice, and places one set of bottles in a warm location, and the other set of bottles in a refrigerator. What would you expect for the results of this experiment?

16. Is carbon dioxide the only product of cellular respiration? Explain.