Is it Alive?

Metabolism/Growth: Does our specimen use energy?

Background

We know that all living things need energy, but how can we observe an organism using energy? We can see it when an organism walks, flies or swims. We can feel it when an organism warms itself up from the inside, but it's not always easy to observe energy use directly. Instead, we may have to look for other clues to infer whether our specimen is using energy.

When organisms use energy, we call that metabolism or respiration. This is related to breathing. You already know that when you exercise or run you need to breathe harder. That's because your cells need oxygen to use the energy in your food. Also when your cells use energy, they make more carbon dioxide, which you breathe out. In fact, all organisms release carbon dioxide (CO_2) as they respire, even if they don't have lungs to breathe like we do. If we can observe the specimen releasing CO_2, that could be a clue that it is respiring, especially if it does it mostly when we give it food.

Materials

- 2 flasks (125-250 ml)
- 3 small plastic cups (for measurement)
- Sample of specimen
- Warm water (40.5-43°C)
- Sugar
- 2 standard balloons
- String (at least 35 cm)
- Metric ruler
- Paper towel
- Scale or balance

Procedure

IMPORTANT To make this a fair test, we will be setting up two flasks of our specimen, one with food, one without. It is important that you keep EVERYTHING the SAME in both flasks EXCEPT the food. Only one flask will have the food (sugar).**

1. Set up your data table in your science notebook, so you will be ready to record your data. (See the sample on the back of this page.)
2. Use the graduated cylinder to measure and pour 50 ml of water into each flask.
3. Use the scale to measure 2 cups of specimen with 5 grams in each cup; then pour one into each flask.
4. Then use the scale to measure 5g of sugar into a 3rd cup. Add it to only one of the flasks. Label this flask "food" and the one without sugar "no food."
5. Stir your specimen by gently swirling the flasks around.
6. Place one balloon over the top of each flask so it can capture any gas that is released.
7. Record the total volume of water, sugar and specimen in your flask immediately after you finish stirring.
8. Measure the circumference of the balloon by wrapping the string around the widest part of the balloon. Use your finger or a clip to mark the length of the string wrapped around the balloon; then lay the string out flat next to the ruler to measure how many centimeters of string that was.
9. Write down any other observations you made at this time.
10. Let the mixture sit for 5 minutes.

(See more instructions on the back.)

11. Record the <u>new</u> volume of the mixture.
12. Measure and record the new circumference of each balloon.
13. Describe any other observations you made during this time.
14. If you have time, let the mixture sit for 5 more minutes, then take the measurements again and record them in your data section.
15. Clean up:
    a. Take the specimen mixture and dump it in the discard container.
    b. Rinse the flask with water and dump that in the discard container as well.
    c. If the balloon got dirty, please throw it away. If it is clean, please put it back.
    d. Put away all of your other supplies.
16. Compare your results with food (sugar) to the results without food. What does this tell you?

<u>Data</u>:
In your data section, make a table like this one to record your measurements and observations.

Time	Mixture Volume (ml)		Balloon Circumference (cm)		Other observations	
	Food	No Food	Food	No Food	Food	No Food
0 min _____:_____						
5 min _____:_____						
10 min _____:_____						
15 min _____:_____						
Total Changes						