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45 Minutes

Virtual STEAM

Science and Math

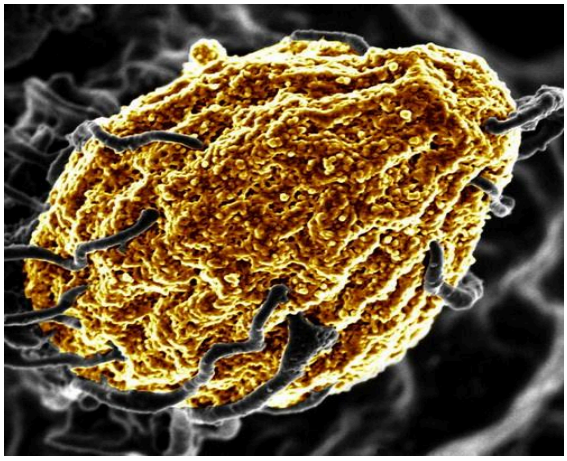
Characteristics of Life

Objective: Students can identify and explain the characteristics of life.

Science Indicator: SC.HS.8.3 Gather, analyze, and communicate evidence of the flow of energy and cycling of matter in organisms and ecosystems.
Math Indicator:: MA 11.4.2 Analysis & Applications: Students will analyze data to address the situation.

Materials:

- 4 Test Tubes
- 1 Test Tube Rack (Block of Styrofoam)
- 1 Packet of Dry Yeast
- 1 Packet of Sugar
- 4 Balloons
- 4 Labels



Book Extension:

- What Is Life?: Five Great Ideas in Biology

Instructions:

1. Watch Video for background knowledge:

https://www.youtube.com/watch?v=cQPVXrV0GNA

2. Yeast is commonly used to make bread, but is it alive?
3. Label the test tubes 1-4.
4. **Test Tube #1:** Fill test tube #1 4/5 full with warm tap water.
5. Add one packet of dry yeast a little at a time to this test tube. Mix thoroughly by shaking the tube with a thumb over the top.
6. **Distribute** the yeast solution from test tube #1 evenly between all four test tubes.
7. **Test Tube #1 and #2:** Add ½ of the packet of sugar to test tube #1, and add the other ½ to test

tube #2. **Do <u>not</u> add sugar to test tube #3 or test tube #4.** This experiment assesses if yeast can produce gaseous carbon dioxide (CO_2) (and energy) from sugar and water. The process of converting oxygen and sugar into CO_2 and energy is known as cellular respiration. If CO_2 is produced, it would serve as evidence that yeast is a living organism.

8. Add warm tap water to each test tube to fill 4/5 of the way to the top.
9. Cover the opening of each tube with a balloon so that it will catch any gas that is produced. Hold a finger over the end of each test tube and shake vigorously to mix the tubes' contents.
10. Now, every 5 minutes for 30 minutes, observe what you see in the test tubes, as well as any changes in the balloons. Record these observations in your Yeast Metabolism Experiment Observations chart
11. When you've finished, be sure to answer the question at the bottom of your Yeast Metabolism Experiment Observations, Is Yeast Alive? Why or Why Not?.

<u>Video Extension</u>:

- 7 Characteristics of Life

<u>Lesson Extensions:</u>

- Test tubes #3 and #4 served as control test tubes. Why were these necessary?
- Why would it be better to use two test tubes for both the control (yeast without sugar) and experiment (yeast with sugar) groups instead of using one test tube for each group?
- Based on your experimental results, are yeast alive?
- When bread is made without yeast, it is hard and does not rise, but bread with yeast is fluffy and bigger. Why might this be?
- When yeast produce CO_2 from oxygen and sugar, energy in the form of ATP (a small high-energy molecule within yeast cells) is also produced. Why would cellular respiration be necessary for the survival of yeast?

<u>Ignite Our Future Connection</u>:

- Cooperation - Without yeast, bread turns out hard, flat, and nearly inedible. It takes yeast to make bread delicious. Just like how flour, water, salt, sugar, and yeast come together to create tasty bread, when we cooperate with each other, we can achieve amazing things.

45 Minutes

Yeast Metabolism Experiment Observations

	0 Minutes	5 Minutes	10 Minutes	15 Minutes	20 Minutes	25 Minutes	30 Minutes
Test Tube #1 (Yeast + Sugar)							
Test Tube #2 (Yeast + Sugar)							
Test Tube #3 (Yeast)							
Test Tube #4 (Yeast)							

Results: Is yeast alive? Why or Why not?

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