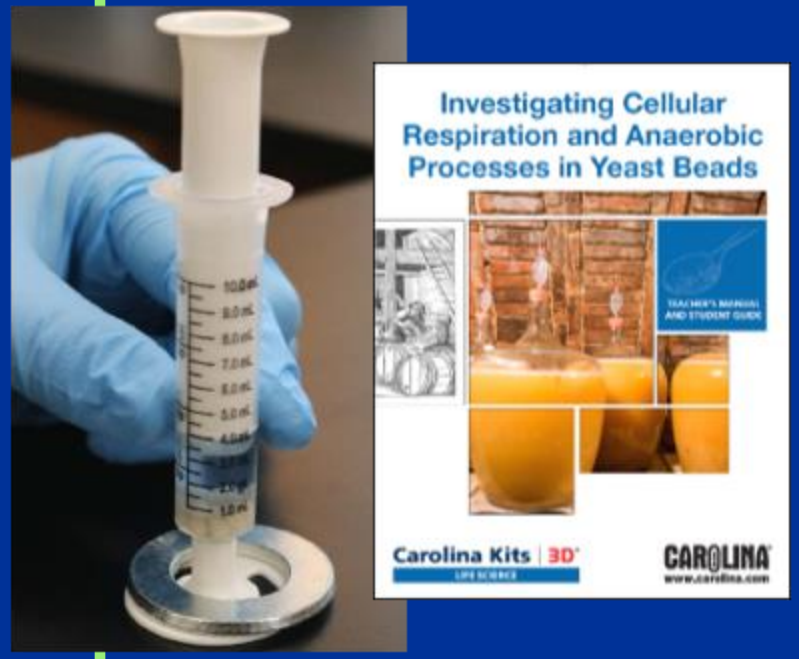


Cellular Respiration and Photosynthesis: Teaching Common Biology Concepts with Alginate Beads

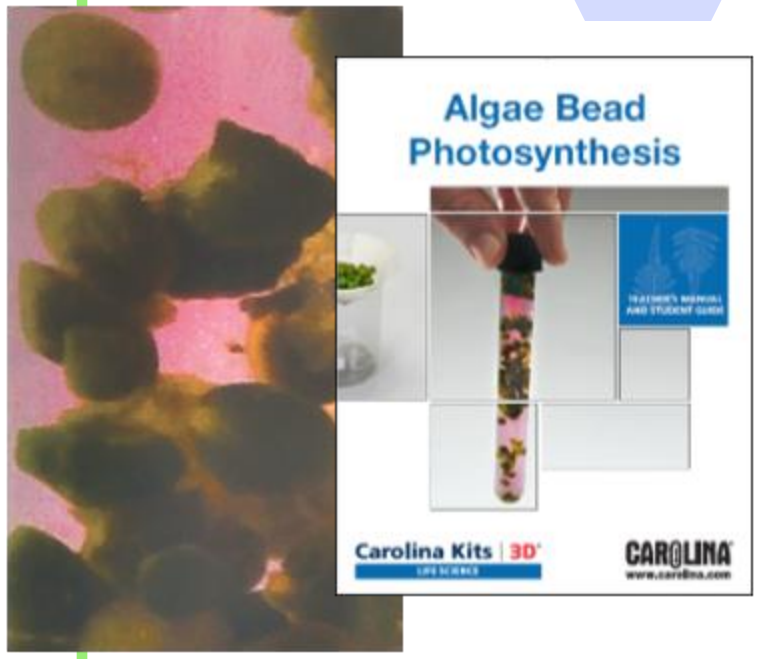
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Workshop Overview



Activity 1

Yeast Beads: Cellular Respiration



Activity 2

Algae Beads: Photosynthesis

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Safety Requirements

- **Personal Protective Equipment (PPE)**
  - Gloves and safety goggles have been provided.
  - You will need to wear your PPE for the duration of both activities.
- **Safety Tip**
  - Clear your workspace of phones, papers, books, and other personal items.
- **Water**
  - This workshop involves the use of water and other liquids. Please make sure that anything you don't want to get wet is put away.







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Activity 1: Investigating Cellular Respiration and Anaerobic Processes in Yeast Beads

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Building Toward TEKS Science Concepts

Activity 1: Investigating Cellular Respiration and Anaerobic Processes in Yeast Beads

This activity aligns with the following TEKS high school science standard:

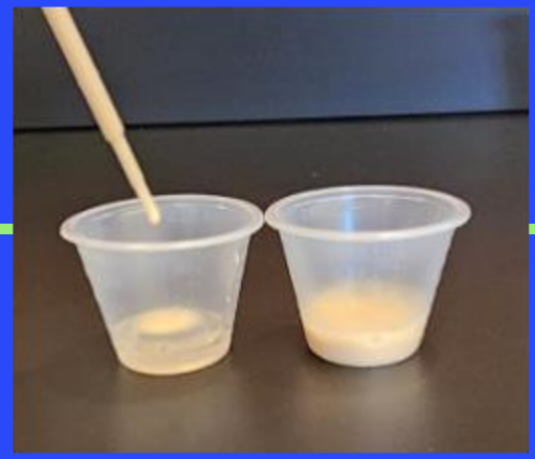
- **B.11A:** Explain how matter is conserved and energy is transferred during photosynthesis and cellular respiration using models, including the chemical equations for these processes.

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Procedure: Making Yeast Beads

1. Fill a 9 oz plastic cup approximately 1/4 full of calcium chloride.
2. Use a clean pipet to transfer 5 mL of sodium alginate solution to a plastic medicine cup.
3. Add 5 mL of the yeast culture to the medicine cup containing sodium alginate.
4. Gently mix the yeast solution and the alginate mixture with the tip of the pipet. Be careful not to introduce air bubbles into the mixture.
5. Carefully draw the sodium alginate-yeast mixture into the pipet.

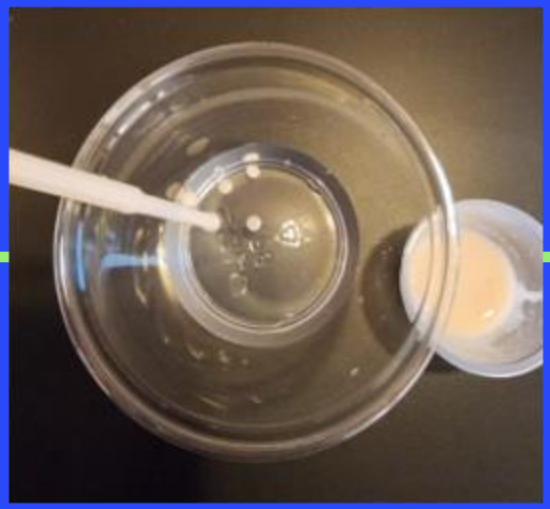




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Procedure: Making Yeast Beads

6. Hold the pipet approximately 4 cm above the calcium chloride solution; then, slowly drip the mixture into the plastic cup containing calcium chloride. Yeast beads will appear and begin to congeal on contact with the calcium chloride solution.
7. Continue to create additional yeast beads with the remaining sodium alginate-yeast mixture.
8. Allow the formed beads to remain in the calcium chloride solution for approximately 1 minute.





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Procedure: Making Yeast Beads

9. Place the strainer over and partly into the empty plastic cup. Separate the beads from the calcium chloride by pouring the bead-calcium chloride mixture into the filter.





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Procedure: Experiment

1. Remove the plunger from the syringe.
2. Place a washer over the base of the syringe stand.
3. Use a plastic spoon to fill the syringe to the 3.0-mL mark with yeast beads.
4. Carefully insert the plunger approximately 2 mm into the opening of the syringe chamber, just far enough to loosely connect the two pieces.



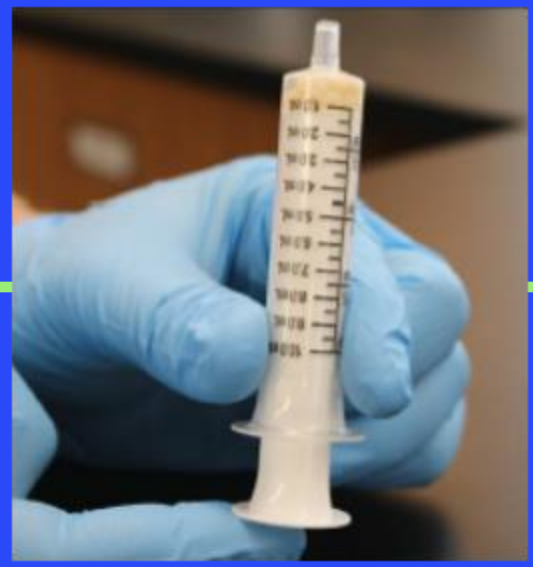


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Procedure: Experiment

5. Invert the respirometer and tap the inverted respirometer to dislodge yeast beads from the tip.
6. Slowly compress the plunger on the inverted syringe to the 3.0-mL mark, being careful not to expel any yeast beads from the tip of the syringe.





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Procedure: Experiment

7. Draw up 3 mL of sugar solution by placing the tip of the syringe in the sugar solution and then slowly drawing up solution to the 6.0-mL graduated mark on the syringe.
8. Being careful not to depress the white plunger, fit the respirometer back onto the base of the syringe stand with washer.
9. Observe the respirometer over the next 5 to 10 minutes.



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Discussion

- What did you see?
- Why do you think you saw that?
- What would you expect to see in a syringe that did not have glucose added?



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Activity 2: Algae Bead Photosynthesis

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Building Toward TEKS Science Concepts

Activity 2: Algae Bead Photosynthesis

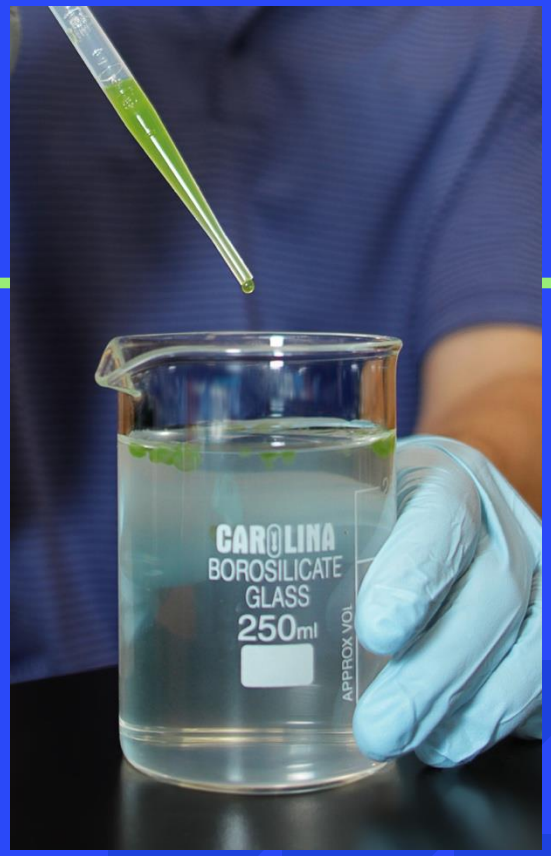
This activity aligns with the following TEKS high school science standard:

- **B.11A:** Explain how matter is conserved and energy is transferred during photosynthesis and cellular respiration using models, including the chemical equations for these processes.

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Procedure: Making Algae Beads

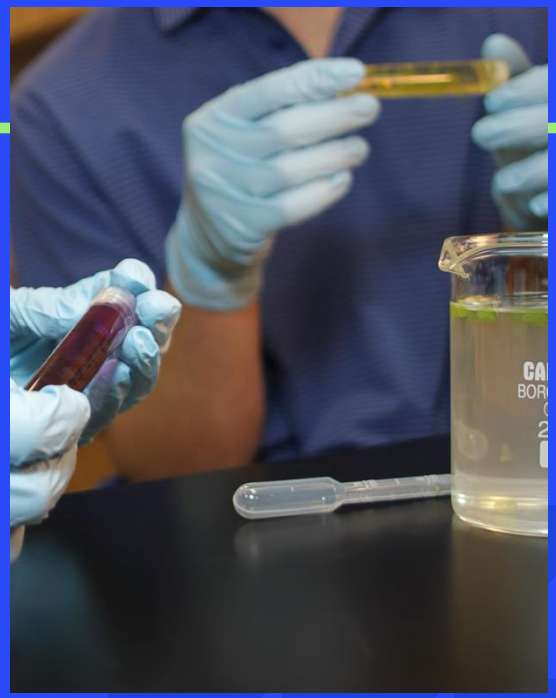
1. Use the tip of a pipet to stir the algal culture and resuspend the algal cells so that they are evenly distributed in the solution.
2. Using a clean pipet, transfer 5 mL of sodium alginate solution to a plastic medicine cup.
3. Add 5 mL of the concentrated algae to the medicine cup containing sodium alginate.
4. Gently mix the concentrated algae and the alginate mixture with the tip of the pipet. Be careful not to introduce air bubbles into the mixture.
5. Depress the pipet bulb, and then carefully draw the sodium alginate-algae mixture into your pipet.
6. Hold the pipet approximately 1 cm above the calcium chloride solution and then slowly drip the mixture into the solution. Algae beads will form on contact with the calcium chloride solution.



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Procedure: Making Algae Beads

7. Continue to drip the remainder of the mixture and then dispose of the pipet used to form the beads.
8. Place the strainer over and partially into the empty plastic cup. Separate the beads from the calcium chloride by pouring the bead-calcium chloride mixture into the strainer.
9. Fill the 15-mL conical tube halfway with algae beads.
10. Add 15 drops of bicarbonate indicator solution to the algae beads in the tube.
11. Fill the tube with spring water and secure the cap.



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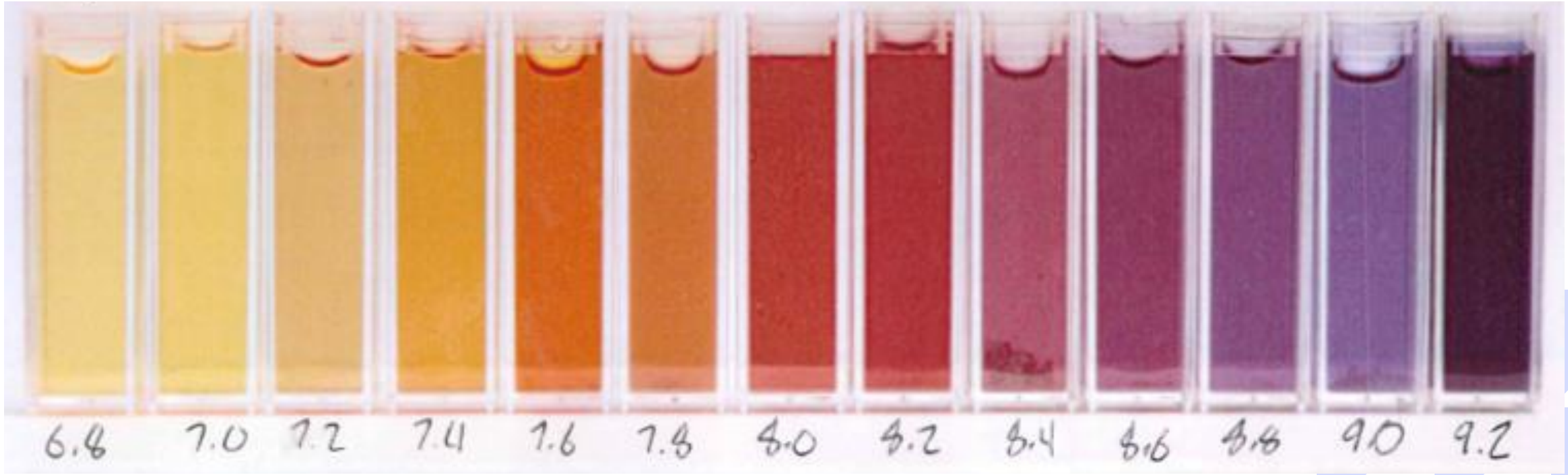
Procedure: Making Algae Beads





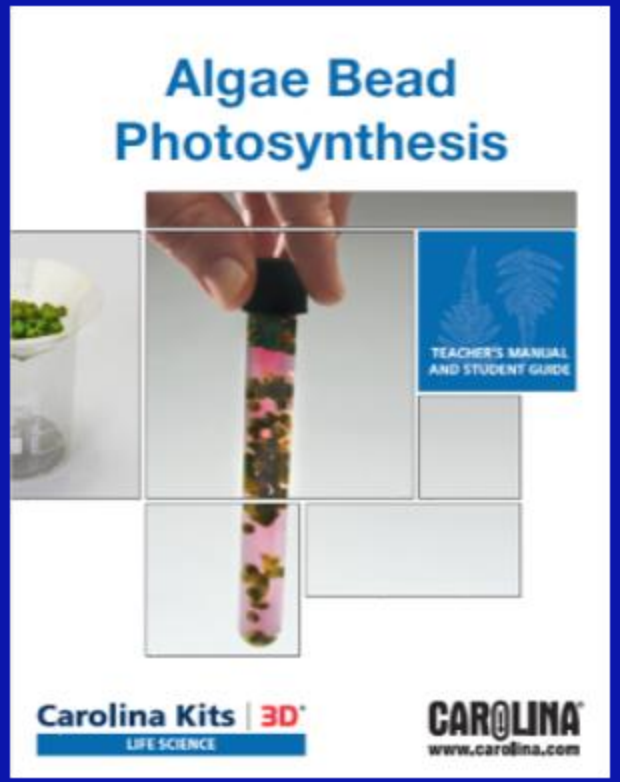
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Procedure: Making Algae Beads



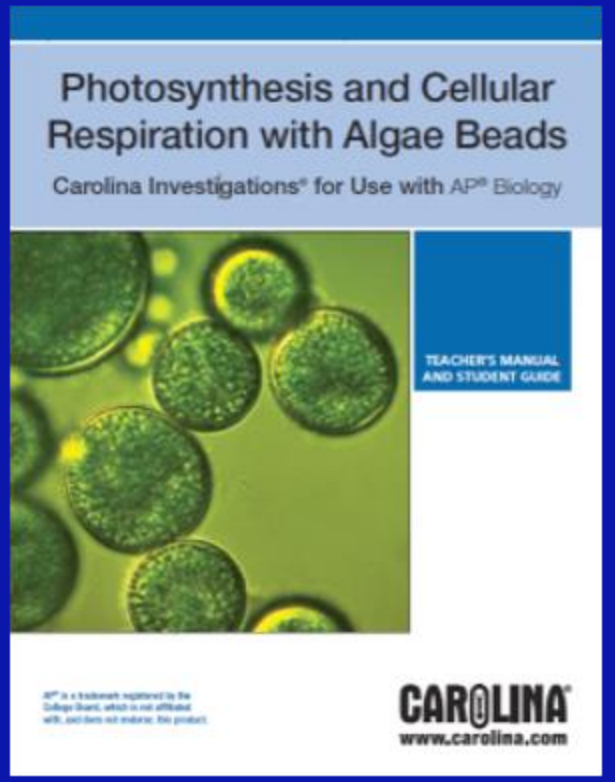
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Workshop Review



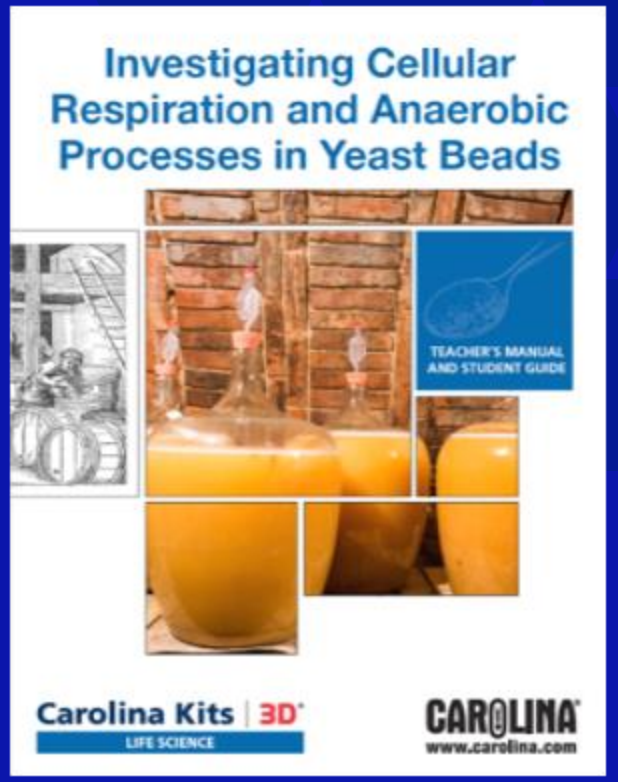
Algae Bead Photosynthesis

Item #206100



Photosynthesis and Cellular Respiration with Algae Beads

Item #747760



Investigating Cellular Respiration and Anaerobic Processes in Yeast Beads

Item #202208

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