THE GREAT PLANKTON RACE
Adapted from: http://marinediscovery.arizona.edu/lessonsF00/bryozoans/2.html

PURPOSE
Students learn that plankton have a variety of unique adaptations which help them avoid sinking below the photic zone. Students construct plankton models from materials of various shapes and densities to simulate adaptations that slow sinking. Students "race" their models (slowest wins), and calculate sinking rates.

TEACHER BACKGROUND INFORMATION
The Secret Life of Plankton (great for students to see what plankton look like and how they behave.) www.youtube.com/watch?t=342&v=xFQ_fO2D7f0

All plankton must avoid sinking. Phytoplankton need sunlight for photosynthesis, so they must stay within the photic zone, usually the top 100 meters. Zooplankton depend on phytoplankton and other zooplankton for food, so they must avoid sinking as well. Plankton avoid sinking by increasing their surface area and/or decreasing their density. Most plankton are quite small and so have a larger surface area to volume ratio than do larger organisms. Flattened bodies and appendages, spines, and other body projections also slow sinking by adding surface area without increasing density. Some diatoms resist sinking by forming chains. The use of low-density substances like oil or fat helps increase buoyancy and can serve as food reserves. In addition, water currents caused by convection and upwelling can stir the water and help keep plankton from sinking.

MATERIALS FOR GROUPS OF 4
• large clear bin
• clear bins
• stopwatch
• Styrofoam packing "peanuts" (the non-biodegradable kind)
• toothpicks, paperclips, plastic stirrers, foam, beads, (optional: metal washers, yarn, fishing sinkers, feathers, etc.)
• lab worksheet

PROCEDURE
1. Ask the students questions: What are plankton? What are some types of plankton? Why are they important?
2. Pass out lab worksheet. Have students observe photos, slides of various plankton, then record observations like colors, shapes, spines, and motion.
3. Have students brainstorm possible advantages to observed adaptations. Brainstorm ways that plankton could reduce sinking rates. (Flattened appendages, small bodies, large surface area relative to volume, reduced density, oil or gas floats, chains, etc.)
4. Tell students that they will be creating their own plankton and that the slowest one to sink to the bottom wins.
5. Have them get into groups (3-4) around the supplies.
6. At the group's table, there will be a bag of materials and bin to practice sinking in. At the end of the time, students will choose the one they like the best to race.
7. Have one person from each group describe their plankton and the adaptations it has to sink slowly.
8. Have them record their hypothesis of why it will sink the slowest.
9. Have a few students be timers. If the aquarium/bin in front of the class is large enough, have the groups race against each other at the same time.
10. Record the depth of the tank and the times of each group. Repeat if the races if time permits.
11. Have the students figure out the average time and the sinking rates for each group.
12. Declare the slowest one the winner.
13. Record the conclusions and give reasons why they think one plankton was the slowest.
THE GREAT PLANKTON RACE

Observations:

Hypothesis:

Data: Time it takes for plankton to sink

<table>
<thead>
<tr>
<th>Group Name</th>
<th>Time1 (sec)</th>
<th>Time 2 (sec)</th>
<th>Time 3 (sec)</th>
<th>Avg. Time (sec)</th>
<th>Distance (cm)</th>
<th>Rate (cm/sec)</th>
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Formula for Average Time = \[
\frac{\text{Time 1} + \text{Time 2} + \text{Time 3}}{3}
\]

Formula for Rate = \[
\frac{\text{Distance}}{\text{Avg. Time}}
\]

Calculate the average time and the rates for each of the groups and fill in the data table.

Conclusion:
Which plankton was the slowest?

Why was that plankton the slowest?

Discussion Questions:
We conducted this experiment with fresh water, would there be a difference if we used seawater (salt water)? Why or why not?

Why did we repeat the races several times?