

Algaculture and Biofuel

Teacher Preparation Instructions

Instructions for Preparing Bulk Algae Cultures:

Bulked algae cultures should be started **at least** 1 month prior to the lesson activities, but more time will allow for mistakes or for a more robust algae culture. It may even be desirable to save time by preserving cultures generated by students for subsequent terms.

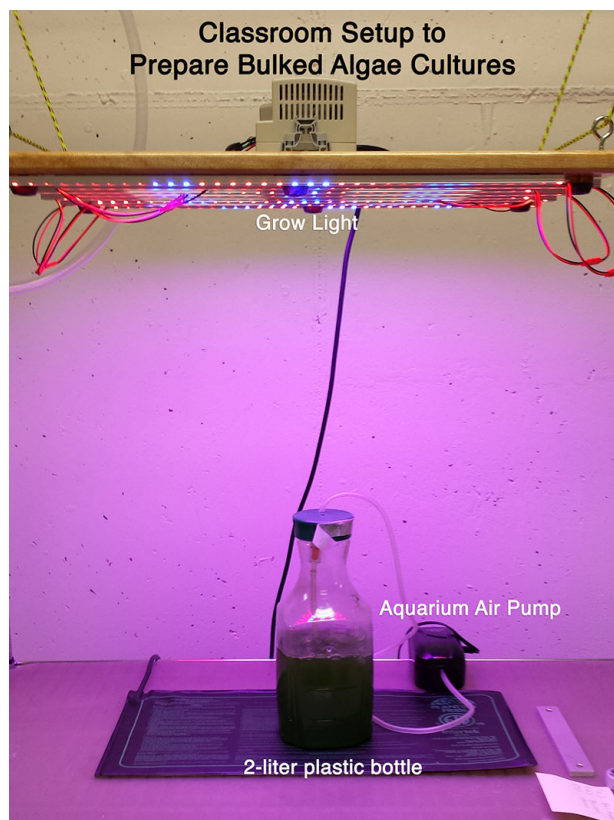
To create a successful culture, obtain a sample of *Chlorella* or other microalgae. These can be ordered from various science education suppliers (e.g., Carolina) online. They come in a small, capped test tube. Once you receive your sample, you should begin the process of growing your culture within 24 hours so that the sample doesn't start to die.

Start with a large, clear glass or plastic container such as a 2-liter soda bottle. If you have many students, you will want to prepare several of these (plan on at least 100 mL per group of students). Fill the container with non-chlorinated water. You can de-chlorinate municipal tap water in two ways. First, if your municipal water provider does NOT use chloramine in your water supply, you can de-chlorinate the water by simply allowing it to sit out for a minimum of 24 hours. The dissolved chlorine gas will simply off-gas during this time. You can add an aquarium bubbler to help the process along if you wish. If your municipal water provider DOES use chloramine, you will have to purchase an aquarium water conditioner at your local pet retailer, and use it according to the instructions. If you are unable to determine whether your municipal water provider uses chloramine, err on the side of caution and use the aquarium water conditioner. Be sure to allow time for it to work before introducing the algae.

After de-chlorination, add a couple of pinches (about 1/8 – 1/4 tsp.) of all-purpose fertilizer granules (e.g., MiracleGro). Swirl the water to dissolve the granules. Next, add the algae culture to the water-fertilizer mixture and swirl to mix.

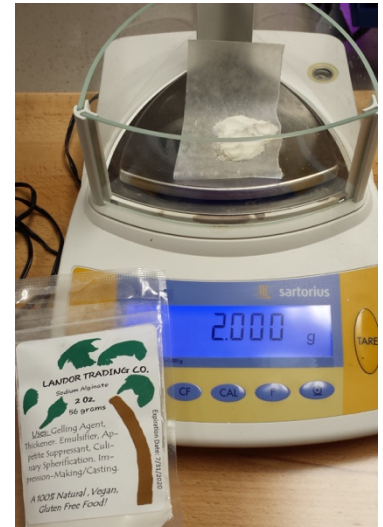
Now, place the container (uncapped) in a warm location (under a grow light or in direct sunlight.) Use an aquarium bubbler to pump air bubbles through the algae mixture to increase the availability of CO₂. Allow the culture to grow, adding a pinch of fertilizer every week, for 3-4 weeks, or until it takes on a **very** dark green coloring, something like "pea soup." The better your lighting source, the faster it will grow, the faster it grows, the more quickly you'll achieve an adequately bulked culture.

About 2 days prior to the activity, measure out 50 mL samples of the bulked algae culture (1 sample per group of students). Cover lightly with plastic wrap or foil and place in a dark room and allow the algae to settle out of each sample (this may take a couple of days). You should get approximately 5 mL of algae settling out from each 50-mL sample. If your sample is not sufficiently bulked, you'll have to start with more than 50 mL to achieve the 5 mL of algae. Another, faster alternative is to use a centrifuge to separate the algae, if you have one available.



Instructions for Sodium Alginate Preparation

Sodium Alginate solution should be prepared the day before the lesson. Once made, the solution can be stored at approximately 4° C for several days. To prepare a 2% by mass solution, measure 2 grams of sodium alginate powder into 98 mL of water and stir. The powder may not mix in immediately, and may need to be left overnight to dissolve completely. Do not heat the mixture. Be aware that the viscosity of the solution can vary from batch to batch, so you should test the viscosity prior to the lesson. You should be able to pour the solution slowly.



Instructions for Calcium Chloride Preparation

The Calcium Chloride solution may be prepared just prior to the lesson. To prepare a 3% by mass solution, add 3g calcium chloride to 97 mL water, and stir until dissolved. This solution may be stored indefinitely.

