

1. Grow algal culture

A starter culture and enrichment media are supplied with the kit. This needs to be cultured for around 4 weeks prior to conducting the experiment to ensure there are sufficient algal cells.

Equipment

Supplied:

- Algae starter culture
- 0.7 g growth media

Also required

- 1000 ml of unchlorinated tap water (or let chlorinated water sit for a few days)
- A two litre container (such as a clear plastic soft-drink bottle)
- Aquarium pump with tubing and airstone (or other diffuser)
- Foam or cotton wool for closing the bottle top to prevent contamination. Ideally this is non-porous material, nylon pillow stuffing works well.
- One low temperature light source (LED or energy saving bulb).

Method

1. Ensure all culture equipment is clean and detergent free.
2. In culture vessel mix the growth media and water. It may not all dissolve.
3. Pour in the starter culture to inoculate.
4. Insert the airline tubing with diffuser attached. The air flow will provide additional CO₂ for algal growth and also keep the cells suspended for faster growth.
5. Stopper the bottle with the foam/cotton wool to prevent contaminants entering but allow gas to escape.
6. For fastest growth illuminate the culture at around 18–20°C. The algae can be also be grown on a south facing windowsill out of direct light, but growth will be slower.
7. Culture is ready for use once it is a deep green colour, usually 3–4 weeks.
8. Remove the air hose to allow the algae to sediment out of the solution, best results are achieved after 48–72 hours, but 24 hours should give you enough cells. Pour off the clear(ish) liquid leaving the dark green sediment.
9. Each group requires 3 ml of this concentrated cell mixture.

Acknowledgment

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Eldridge, D. (2004) A novel approach to photosynthesis practicals. *School Science Review* 85 (312) 37–45.

2. Prepare 4% w/v sodium alginate solution

Equipment

Supplied

- 4 g sodium alginate powder

Also required

- 100 ml distilled water
- 250 ml glass flask/beaker. Clean and rinse with distilled water to remove any calcium ions.
- Magnetic hotplate stirrer. 37°C (ideally) (30–40°C works just fine), **Note:** Excessive heat depolymerises the alginate.

Method

Best prepared the day before as sodium alginate is slow to dissolve.

1. Pour the water into the flask and place on a heated stirrer.
2. Slowly sprinkle in the sodium alginate powder to avoid lumps.
3. Leave to dissolve, 1–2 hours will be enough if you use a heated stirrer, otherwise allow another 1–2 hours.
4. Each group requires 3 ml of the alginate solution.

If you wish to store the solution for more than a few days it can be autoclaved after increasing the pH to between 7–8.

3. Prepare 2% w/v calcium chloride solution

Equipment

Required

- 20 g calcium chloride dihydrate (CaCl₂·2H₂O)
- 1000 ml distilled water

Method

- Dissolve the calcium chloride in the distilled water.
- Each group requires around 50 ml of the calcium chloride solution

4. Prepare hydrogen carbonate indicator solution

Hydrogen carbonate solution is highly sensitive to pH, rinse all glassware with a little of the indicator before use.

Supplied

- 50 ml of concentrated indicator solution
- 450 ml of cooled freshly boiled distilled water

Method

1. Pour the concentrated solution into the water.
2. Adjust the pH to 7.4 (A few drops of 1 M HCl)
3. Aerate the solution before use, it should go a bright red colour.
4. Each group requires around 50 ml of the indicator solution.