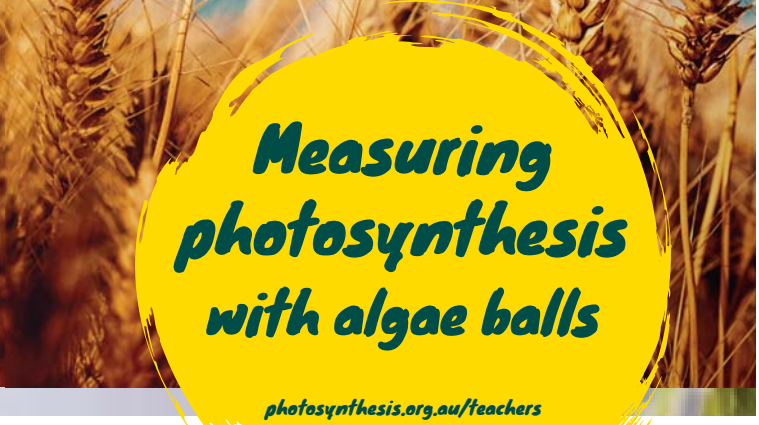


Measuring photosynthesis with algae balls

photosynthesis.org.au/teachers

You'll need

- 1 teaspoon powdered sodium alginate, mixed well with 1/2 cup of tap water
- 1 heaped teaspoon calcium chloride, mixed with 1 cup tap water
- concentrated algae solution
- pipette (it's like an eyedropper)
- 2-3 epitubes (or other small sealable container)
- pH indicator (we use a mix of cresol red and bromothymol blue)

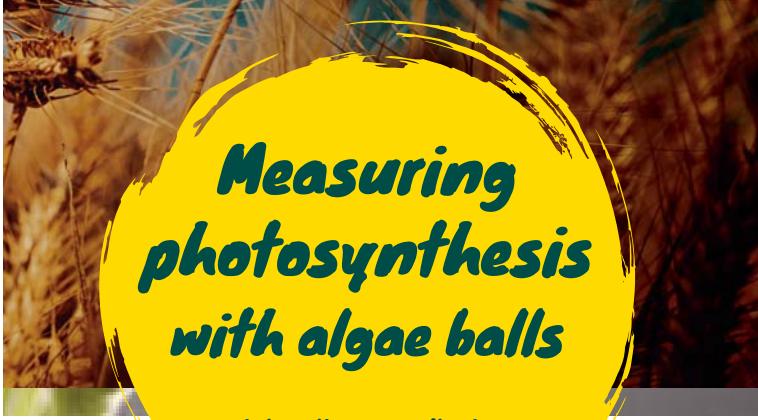
Make the algae balls

- Mix a 1:1 ratio of sodium alginate with the concentrated algae solution
- Use a pipette to squeeze droplets of sodium alginate/algae solution into the calcium chloride solution
- Leave them for a few seconds to set
- ... Voila!! You've made algae balls

Do the experiment

- Place your algae balls into separate epitubes
- You'll need at least 2 epitubes so you can compare the results
- Fill each epitube to the top with pH indicator
- Decide what your constants are (the things that stay the same)
- Decide what your variable is (that's the one thing that changes)
- See what happens next, using the pH scale below as a guide.

Note: The pH is affected by changes in carbon dioxide in the system.
When a lot of carbon dioxide is present, it dissolves in a special way that decreases the pH, making it acidic. When carbon dioxide has been taken out of the system, there will be an increase in pH, making it basic.



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More information

The algae continues to live happily, immobilised in the gel balls. The algae keeps photosynthesising.

When you put the algae balls in a pH indicator, the pH is affected by changes in total carbon dioxide concentration.

When a lot of carbon dioxide is present, it dissolves as carbonic acid/bicarbonate which decreases the pH, (making it more acidic by having lots of positively-charge protons floating about).

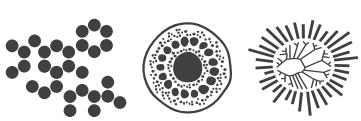
The protonation changes how light is absorbed by the indicator, and changes how it looks.

At the other end of the scale, where carbon dioxide is lost from the solution, there is less carbonic acid and bicarbonate and the pH goes up (because there are fewer protons floating around), resulting in de-protonation of the indicator molecules and, again, changing the way the molecule interacts with light energy.

Algae	Animals
Photosynthesises	Respires
Carbon dioxide and water are converted to sugar and oxygen	Oxygen and sugar are converted to carbon dioxide and water
$6CO_2 + 6H_2O = C_6H_{12}O_6 + 6O_2$	$C_6H_{12}O_6 + 6O_2 = 6CO_2 + 6H_2O$

This activity was adapted from a resource developed through the Science and Plants for Schools (SAPS) programme. The original resource and others supporting biology education can be downloaded for free from the SAPS website: www.saps.org.uk

More teacher resources have been, and are being developed by the Centre. Find out more at: www.photosynthesis.org.au/teachers



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