

“Water analysis”

Subject: Biology/Environment

Sensor: Colorimeter

Overview:

The Colorimeter can be used as a method of monitoring the formation of algae in water. When eutrophication occurs in streams and ponds, it is usually a result of human activity where the amount of nitrogen and phosphorus inorganic plant nutrient levels have been artificially increased due to fertilizer wash off from fields. This process without human interference, normally happens over a long period of time as dead organic matter accumulates.

Where an increase in either the phosphorus or nitrogen nutrients occurs then an algae bloom can result. Anyone who has set up an aquarium at home knows that this can be a real problem as the light struggles to reach plants and fish at the bottom, particularly if it is a deep tank.

This procedure uses the Colorimeter to monitor the light transmission through the water samples to see when algae is formed and what effect differing levels of liquid fertilizer has on the algae formation.

Equipment required: LogIT DataLogger

- 1 Colorimeter
- 1 Cuvette
- 1 Pipette or small burette
- Some 2 litre plastic drink bottles
- Liquid household fertilizer
- Pond water
- Aquarium fluorescent light or lights (You can of course use natural sunlight)
- Distilled water
- Paper towels or tissue paper to dry the cuvette
- Large cardboard box to cover the water bottles

Hazards:

Any sample of water must never be consumed.

Always check your local regulations or the school advisory service such as CLEAPSS or SSERC for guidance on the use of any hazardous materials or chemicals.

Calibration:

1. Fill a cuvette with 4 ml of distilled water and place it in the colorimeter.
2. Place the cap on and then adjust the calibration dial until you obtain 100% T (Transmission)

Monitoring:

1. Take 4 ml of water from the plastic bottle being monitored.
2. Place the water into a cuvette and place in the colorimeter. (Select the BLUE light source)
3. Take a 'snapshot' reading of the sample.
4. Repeat for each of the bottles.

Method:

1. Fill 5 plastic bottles with pond water.
 2. Label the bottles 1 to 5
 3. Put 5 ml of liquid fertilizer into bottle 1 and add 5 ml increments to bottles 2, 3 and 4. (ie. bottle 4 has 20 ml of liquid fertilizer) Don't add any to bottle 5.
 4. Put an aquarium fluorescent tube over the bottles in a large cardboard box.
 5. Monitor the light transmission using the Colorimeter daily. (You can note the results in a spreadsheet)
- Note: You might like to use more bottles so as to have repeat data on each of the fertilizer concentrations. Also, don't forget to calibrate the Colorimeter and also use the same cuvette.

Results:

Hopefully the results will show an algae 'bloom' occurring either sooner or later in the bottles and the time taken should relate to the levels of fertilizer in the water.

Going further:

You may like to monitor a real aquarium. If so, do so with a newly set up one as these very often develop algae problems early on in their life.

Try monitoring an aquariums light, pH and dissolved oxygen levels. Can produce some interesting results.