**Investigating the effects of chemical elements on**

**the growth of algae**

*Scenedesmus quadricauda*

*Scenedesmus quadricauda* is a green alga commonly found in freshwater. Like all green algae and plants *Scenedesmus* relies on sunlight and carbon dioxide and water to manufacture food (carbohydrate) by the process of photosynthesis. This food is used immediately in respiration to produce energy, or stored as starch. For healthy growth, green algae (and plants) also require other chemical nutrients for example, calcium, iron, nitrogen, phosphorus, sulphur, magnesium and potassium. Green algae absorb these chemicals through their surfaces; green plants absorb the chemicals through their roots.

The aims of the activities involved in this practical are:

* To investigate how lack of particular chemical nutrients - potassium, nitrogen and phosphorus - affects the growth of a population of green algae.
* To find out which, if any, of these chemical nutrients are most important for the healthy growth of green algae.

In this practical five conical flasks are set up each containing a culture of *Scenedesmus* in a different growth medium.



The media in flasks 2 - 5 contain the chemical nutrients dissolved in distilled water. The complete medium contains all the necessary chemical nutrients for healthy growth.

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| **Flask** | **Growth medium** |
| 1 | Distilled water |
| 2 | Complete medium |
| 3 | Medium without nitrogen |
| 4 | Medium without phosphorus |
| 5 | Medium without potassium |

**Materials**

* Small bottle containing a culture of *Scenedesmus*
* 5 x 250 cm3 conical flasks which have been numbered, labelled and fitted with loose fitting foil covers, or cotton wool plugs. Each flask containing 100 cm3 of growth medium (see table).
* 1 cm3 plastic pipette
* Marker pen
* 1% bleach
* Access to a discard jar

**Method**

1. Wash your hands and swab your work area with 1% bleach.
2. Write your name and the date on each flask.
3. Gently shake the small bottle of *Scenedesmus* culture.
4. Using the plastic pipette draw up 1 cm3 *Scenedesmus* culture.
5. Remove the cover / plug from flask 1 and carefully empty the culture from the pipette into the growth medium in the flask.
6. Gently swirl the flask to mix the contents.
7. Repeat steps 3-5 with the remaining flasks so that each flask contains a culture of *Scenedesmus* in a different growth medium.
8. Place the pipette in the discard jar.
9. Swab your work area with 1% bleach and wash your hands.

Keep the flasks in bright light and examine the contents each week for 3-4 weeks.

The growth of the algal populations can be compared by:

* Comparing colour and turbidity (cloudiness) over time. Perhaps you could photograph the flasks each week and note any changes.
* Comparing each population by measuring absorbance using a colorimeter set at 665 nm and calibrated with distilled water.
* Comparing ‘hanging drops’ of samples taken from each population using a microscope. (See Preparing a Hanging Drop, Help Card)
* Your teacher may ask you to estimate the size of the algal populations, and note any changes over time, using a microscope and haemocytometer.