

Helen Innes-Biology Coursework:
Investigation into the effect of temperature
on photosynthesis.

Plan:

I have previously investigated the effect of light intensity on the photosynthesis of pondweed. I would now like to adapt this experiment to investigate the influence of temperature.

Method:

In my previous experiment, we submerged a frond of pondweed in a beaker of water, and shone a microscope lamp on it, varying the distance and studying the results. To test the influence of temperature, we will need to arrange our apparatus so that the temperature can be varied without affecting the light intensity.

- I will set up the pondweed in the beaker as before, but first placing it in an ice bath, till it has cooled to a suitable temperature, such as 5 C.
- I will then remove it, and wrap it in foil, to ensure it remains at a stable temperature for long enough to measure the no. of bubbles per min.
- After two minutes (I plan to take two results at each temperature to improve accuracy.) I will remove the foil and allow it to increase another five or perhaps ten Celsius.
- I will repeat the process, continuing until the water has reached room temperature.

- After this, I would set the beaker above a Bunsen burner on very low heat, and remove it every time the water reached a suitable temperature, initially perhaps 30 Celsius, and as before, rap it in foil, while taking two sets of results

I will be taking measurements in temperature with a thermometer, and counting bubbles per minute, timing with a digital stop clock. I will then display these results in a chart, and plot them in a line graph of temperature against bubbles per minute.

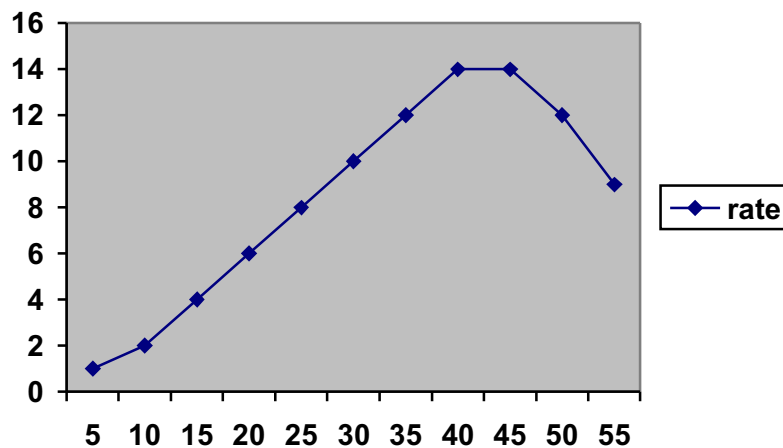
As I have already mentioned, to ensure accuracy I will:

- Take two sets of results at each temperature to average
- Keep the Bunsen burner low to retain constant light intensity

I predict that, as the temperature is increased, the rate of photosynthesis will also increase, until a point at approximately 40 Celsius. Here I think the water will become too warm for the plant, and it will begin to suffer damage, causing photosynthesis to slow, or cease to increase as the temperature continues rising.

The results will show this pattern because of the dependence of all chemical reactions on enzymes. Enzymes are biological catalysts contained within living cells. A catalyst is a substance that increases the rate of a chemical reaction without being consumed by the reaction. All enzymes have an optimum temperature where they work most effectively. This is where the reaction is hot enough for the reactant particles to be colliding frequently with the enzymes, but not too hot for the enzymes to survive. So when the water is at around 40 Celsius,

the enzymes will be at their optimum temperature, and will be able to catalyse the photosynthesis of the pondweed at the highest possible rate. Above this temperature, the rate of photosynthesis will either remain the same or begin to drop off, due to the damage of enzymes.



This is a typical graph of enzyme activity against temperature.

Here are the results of

Distance from lamp/ cm	No. of bubbles per min
5	7
10	7
15	4
20	4
25	2
30	2
35	2
40	1
45	1