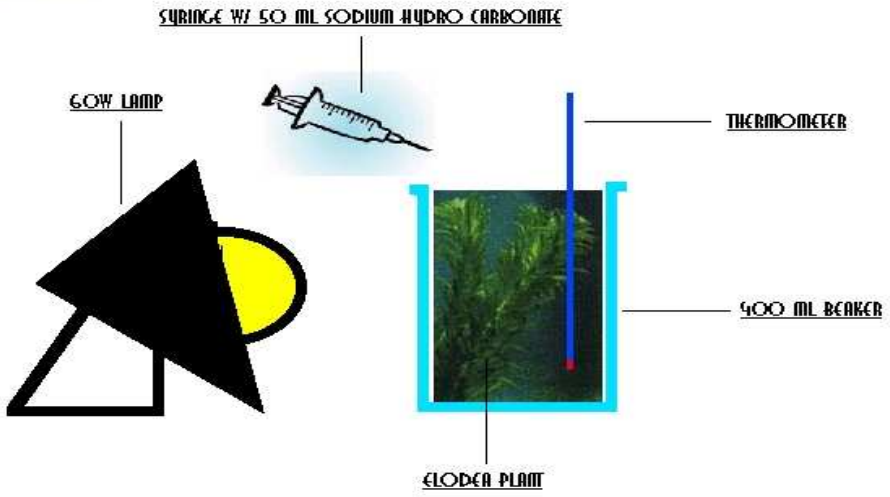
Investigation to state the reaction speed
Of the Elodea plant photosynthesising
(And producing the quantity of oxygen.)

The way I will collect my results is get a 400 ml beaker, put a water plant called Elodea in it make sure that the cut of end fa ces the top fill the beaker with 400 ml of water and add 50 ml of sodium hydro carbonate to speed up the reaction of the plant, I must also measure the temperature of the water make sure it is about 24^{o}C and then put the beaker as close as I can to my light source (60W lamp). Then I would count the bubbles that come out of the cut end of the Elodea plant, and record the amount of bubbles, which are produced every minute. To work out how much oxygen is given out I will calculate the volume of the bubbles.



To make my investigation a fair test I will repeat the experiment twice, and make sure that the distance of the light source is completely correct and measured with a ruler, also I have to use the same plant both

times, same amount of water, same light intensity and 50 ml of sodium hydro carbonate. Before recording my results I will wait for a certain amount of time (15 min).

The equation for photosynthesis is:

Carbon Dioxide + Water → Oxygen + Glucose

$$CO_2 + H_2O \rightarrow O_2 + C_6H_{12}O_6$$

A plant is a living organism but not as complicated as a human, they also need food (energy). They obtain the energy they need by extracting water from the light source, which in this case is a lamp, and carbon dioxide from the air, this is called the process of photosynthesis. For the plant to photosynthesise it uses a source of energy, which is sunlight.

In my investigation my predictions would have to be: the greater the light intensity there is, the more amount of oxygen would be that the plant would produce, this is due to the fact that photosynthesis needs a lot of light.

When I record my results I expect them to be very close to each other because the school doesn't have the facilities needed for accurate measurements for the volume of oxygen given off, therefore I would have to count the bubbles manually but I don't think that I have the ability to make accurate enough measurements without any equipment needed for such an experiment.

I made these predictions because it will allow me to get a sharper range of results. I am positive that my results would be moderately reliable because I will repeat the actual experiment twice. I will modify

the light arrangement the same way that I did in the first time I did the experiment.

To make sure that my results are reliable I will need to do most of these things:

- Use a 60W light source
- Elodea plant has to be cut at the stem
- A 400 ml beaker filled with water (24 ^{o}C)
- A good stopwatch
- A syringe with 50 ml of Sodium Hydro Carbonate
- A thermometer

After successfully completing both of my experiments I got the results shown below:

Distance of the light source from plant (cm)	Number of bubbles per minute (Experiment 1)	Number of bubbles per minute (Experiment 2)
0	12	15
2	11	13
4	9	10
6	7	8
8	6	5
10	3	4

The way I achieved the results was by doing both experiments fairly so that there were hardly any, maybe even none, differences between the both of them, even the temperature of the water was exactly the same in both experiments in the beginning, 24 ^{o}C.

I will graph my results that I got in both of my experiments. In the graphs I will compare the frequency of bubbles to the distance of the light

source from the plant (cm). Also the distance of light from the plant to the volume of oxygen produced. To work out the light density I will use the formula: $\underline{\text{Light Density} = 1/\text{distance}^2}$.

I will also work out the volume of oxygen produced but the thing is that you cannot be to precise because the diameter of each bubble is approximately 1mm. Therefore to work out the volume of the bubble I will have to use the formula for working out the volume of a sphere: $^4/_3\pi r^3$. Therefore from this I can work out the volume of a bubble:

$^4/_3\pi 0.5^3 = 0.52359877559829887307710723054658\text{mm}^3$

$= 0.524\text{mm}^3$ (3 s.f.)

After carefully observing my graphs I found a couple of things:

- The number of bubbles decreases as the lamp is moved further away from the beaker with the plant
- The volume of oxygen decreases due to the decrease in the light density

An exponential decrease in the number of bubbles produced as the light source is moved further away is shown on the graph and from this I can see that I had to move the light source back twice as far to make a significant change in the number of bubbles produced. Therefore from this I can see that in order for the plant to photosynthesise it doesn't need a very intensive light source and it wouldn't make much difference if the light source were moved a bit further or closer to make a significant change.

After analysing and considering my evidence, planning I have realised that my predictions that I made in my planning are moderately correct but again I found out that if I were to be a farmer and grew tomatoes I would be paying an excessive amount of money for my electricity bill because a plant only needs a certain amount of light to photosynthesise and pretty fast.

I felt that my procedure could have been better this is due to many various reasons but the results I got from the experiments were quite good and accurate, you can tell this by looking at the graphs of experiment 1 and experiment 2. The way I got such accurate results is I carried out my procedures accurately I made sure that the Sodium Hydro Carbonate solution was precise I made that I waited for fifteen minutes for the plant

to start photosynthesising properly I counted the bubbles as carefully as I could waiting till the got to the surface and got my timing correct.

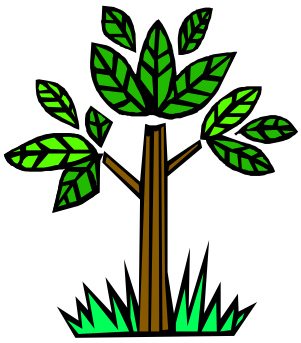
If I had more time the changes that I would make would be probably: -

- Carry out eight or even ten experiments so I get more precise and accurate measurements.
- I would try using various light sources an 80W, 100W and 120W lamps.
- And a more concentrated solution of Sodium Hydro Carbonate.

I think that my measurements and results are quite accurate and reliable, but again they would be more reliable if I carried out more experiments. I think that bring a good example of reaction speed of photosynthesising.

To further my experiment I would need a measuring devise that would measure the amount of oxygen produced. I would also do it in a dark room so that the only light source influencing the process of photosynthesis would be my 60W lamp.

An Investigation to state the reaction speed of Photosynthesis



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