How Does The Light Intensity Effect The Rate Of Photosynthesis

Aim

My aim is to discover how the light intensity on a plant can affect the rate of the photosynthesis reaction. : A piece of pond weed will be cut and placed into a beaker containing water a nd sodium bicarbonate. A lamp will be shined on to the pond weed and the amount of bubbles released from the plant will be counted. The lamp will be adjusted to different distances from the plant to try and obtain different results

Prediction (Hypothesis)

I predict that the greater the light intensity the greater the rate of photosynthesis will be.
The more Sodium bicarbonate inserted into the water solution the greater the photosynthesis reaction will be.

Scientific knoledge

The sun floods the earth with light plants cells use light to help them make food by photosynthesis. They trap the energy in sunlight and use it to convert carbon dioxide and water into sugars. A summery of the chemical reactions that take place is

Carbon Dioxide + Water – Glucose + Oxygen

$6Co_2$ $6H_2O$ $C_6H_{12}O$ $6O_2$

Light Wavelength (colour)- pigments in the leaf such as chlorophyll absorb Light energy. Chlorophyll easily absorbs blue light, in the 400 -450 nm range, and also easily absorbs red light in the 650-700 nm range. Chlorophyll does not absorb green light or yellow light effectively but tends to reflect them, decreasing the amount of light absorbed and decreasing the rate of photosynthesis. Why the rate of photosynthesis increases or decreased from the amount of light energy absorbed is what is being investigated in this experiment. The light colour can be fixed by using the same lamp throughout the experiment. Light intensity is inversely proportional to the distance squared because the light energy spreads out as it travels further and further from its source. Light energy travels along the circumference of an expanding circle. When light energy is released from a point, the energy is dispersed equally along the circumference. But since the circle is expanding, the circumference increases and the same light energy is distributed along a greater surface.

Photosynthesis occurs only in the presence of light, and takes place in the chloroplasts of green plant cells. Photosynthesis can be defined as the production of simple sugars from carbon dioxide and water causing the release of sugar and oxygen. The chemical equation for photosynthesis can be expressed as: (light) $6CO_2 + 6H_2O$ ($C_6H_{12}O_6 + 6O_2$ (in the presence of chlorophyll)
The fact that all plants need light in order to photosynthesise has been proven many times in experiments, and so it is possible to say that without light, the plant would die. The reason that light intensity does affect the rate of photosynthesis is because as light, and therefore energy, falls on the chloroplasts in a leaf, the chlorophyll, which then makes the energy available for chemical reactions in the plant, traps it. Thus, as the amount of sunlight, or in this case light from a bulb, falls on the plant, more energy is absorbed, so more energy is available for the chemical reactions, and so more photosynthesis takes place in a given time.

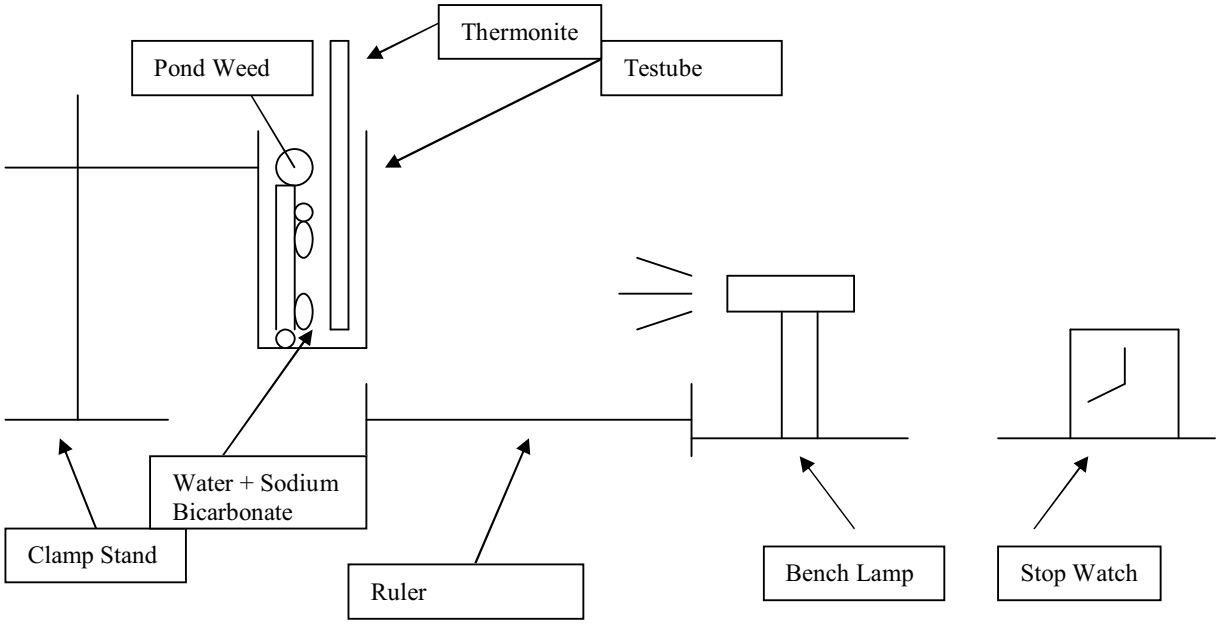
Scientific Knowledge was acquired from: -Pupil Textbook and
http://www.studentcentral.co.uk/coursework/essays/856.html
http://www.essaybank.co.uk/free_coursework/1649.html

Plan

Oxygen is a product of this reaction I can see how fast the reaction is going by counting the bubbles being produced by the plant from a certain spot where I had cut the stem. I will have to be carfull when cutting the stem and I will be using a sharp Knife and I must also be carfull with the pond water and the electrical lamps. The factor I am going to use chage in the experiment is the distance from the to the lamp. The range of this factor is 100cms to 5cms and I will repeat the experiment 3 times. To make it a fair test I am going to try and use the same eqipment and and weed, try to keep the temprature the same
The apperatus I am going to use are
1 Retort Stand and Clamp
1 Bench Lamp with a 60 Watt bulb
1 Thermomiter
1 Stop Watch
1 Ruler
1 Testube
1 Piece of pond weed

Method

He apperatus I used is set up below :-



First I will set up the eqipment shown above then cut the stem of the Pond Weed under water and put it in the solution then put it in the water+sodium bicarbonate solution then put the bench lamp 100cms away from the weed and started the stop watch and counted the bubbles coming from the stem of the weed over a peroid of 5 minites the n repeat the experiment at distances of 60cms, 30cms, 15cms and 5cms. Also recording the water temprature on the thermomiter.

Results

Distance of lanp from plant in cm	Number of bubbles in 5 mins		
Light intensity in distance	1	2	3
1/100	19	17	52
1/60	23	23	80
1/30	28	315	89
1/15	55	382	235
1/5	177	303	596
Temp	24	25	25