Science Investigation

Does raising the light intensity increase the rate of photosynthesis?

Aim: To see if raising the light intensity increases the rate of photosynthesis.

Prediction: I predict that raising the light intensity will increase the rate of photosynthesis. I think this because light is the most important thing needed for photosynthesis. I then think that the rate of photosynthesis will stay the same when it reaches a certain point. I think this because the plant may use up all of the carbon dioxide (Sodium hydro carbonate) and the plant can have as much light as it needs but if it does not have any carbon dioxide it will not be able to photosynthesise. The temperature also has to be right. If it is too hot the enzymes will be destroyed and the plant will not be able to photosynthesise. The temperature and the amount of carbon dioxide are called the limiting factors.
I think a graph of the results would look like this:

Apparatus list:

- Piece of weed
- Paperclip
- Sodium hydro carbonate
- Water
- Test tube
- Beaker
- Lamp
- Stopwatch
- Scissors
- Spatula
- Meter Rule
- Glass Rod
- Measuring Cylinder

Diagram:

Method:

1. Collect the equipment on the equipment list.
2. Darken the room, so that the plant cannot use light for photosynthesising from other places.
3. Cut a piece of weed that is about 5 cm long.
4. Put a spatula measure of sodium hydro carbonate in a test tube with 40ml cold tap water and stir. This provides the plant with enough CO2 to photosynthesise.
5. Fill a 1000ml beaker with 700ml water and put the test tube into it. This will act as heat shield from the lamp, so that the temperature will not affect the experiment.
6. Put the weed in the test tube with the cut end facing upwards.
7. Put the lamp 10cm away form the beaker and switch on.
8. Leave the weed to adjust to the conditions for 1 minute.
9. Time one minute and count the bubbles coming out of the cut end of the leaf for 1 minute.
10. Record the results in a table.
11. Then do the whole experiment 3 times for accuracy, then find the average and record in your table.
12. Do the whole experiment 6 times for 20cm, 30cm, 40cm, 50cm, and 60cm away from the lamp.

Fair Test: To make this a fair test I will not let any of the variables change apart from the light intensity because this is part of the experiment. I will control this variable by measuring the distance between the beaker and the lamp. I will repeat each light intensity 3 times because one of the results may go wrong, or the person counting may have counted wrong and if there are 2 other similar results you will be able spot the odd result. I will leave the weed in the beaker for 1 minute before I start counting the bubbles, so it can adjust to its surroundings. If I did not do this, the speed of photosynthesising may change and affect the results. I will keep the amount of carbon dioxide the same. I will do this by measuring only 1 spatula sodium hydro carbonate for each distance away from the lamp. I will then change the water because it may still contain some sodium hydro carbonate from the previous experiment. I will keep the temperature the same by placing the test tube in a beaker of cold tap water. I will keep the amount of water the same in the beaker, because if there was more water it would take longer to heat up and therefore it would not be a fair test.

Results:

Bubbles Produced in 1 Minute

Distance from Lamp	Light Intensity	Results 1	Results 2	Results 3	Average
10cm		50	57	52	53
20cm		47	63	65	51.6
30cm		11	14	9	11.9
40cm		5	8	5	6
50cm		3	6	3	4

Conclusion: My prediction was correct as the rate of photosynthesis did increase as the light intensity increased. However the results show that the rate of photosynthesis did not stay the same, but the increase did get smaller as the light intensity increased showing that maybe, if there had been more results, the rate of photosynthesis may have levelled put. I think this happened because light is the most important thing needed for photosynthesis. I think the increase got smaller because the plant may have used up all of the carbon dioxide (Sodium hydro carbonate). The temperature also may not have been right. If it was too hot the enzymes would have been destroyed and the plant would not have been able to photosynthesise. The graph shows how the rate of photosynthesis increased the most when the light intensity was the least.

Evaluation: I think my experiment was successful. However I do not think the results were very reliable as they are based on someone counting the bubbles. This could not be accurate for many reasons. The bubbles may have been different sizes and contained different amounts of oxygen. Some of the bubbles may not have been carbon dioxide, but air trapped below the leaf. Also the person counting the bubbles may have made a mistake or counted the same bubble twice. If I did this experiment again I would use electronic equipment to measure the amount of oxygen. I would also use a different type of heat shield because a beaker of water may not be very effective because the water may get warmer, or it may not be a fair test because the tap water might be a different temperature when you change the water.