Planning an experiment to find out if light intensity alters the rate of photosynthesis of a plant

Introduction

In this experiment I am trying to find out if light intensity alters the rate of photosynthesis of a plant by using waterweed in different light intensities. I would have to consider rate-limiting factors such as the amount of carbon dioxide in the water. To make sure the carbon dioxide supply does not run out, sodium hydrogen carbonate could be added in the water. A temperature rise may cause photosynthesis to speed up, so in order for this experiment to be a fair test I would need to keep the water at a constant temperature from the beginning of the experiment. I would also need to know if the bubbles of gas produced by the plant is oxygen. To do this, I would check to see if a glowing splint re-lights in the gas produced by the plant. To vary light intensity, I could use two bulbs of a different wattage.

Prediction

As the rate of light reaction will depend on the light intensity, I would expect that the brighter the light, the faster the rate of photosynthesis. Therefore, when the light is switched off, the bubbling should stop. The rate of bubbling should be faster when the bulb is closer to the plant, measuring the rate of photosynthesis. Additionally, assuming that the bubbles contain oxygen, produced by photosynthesis, I think that an increase in light intensity and in heat will produce an increase in the rate of photosynthesis. This is because both light and heat are needed in order for photosynthesis to take place, and a higher concentration of both will lead to a faster rate of photosynthesis.

Method

I will measure the rate of photosynthesis in this experiment by using waterweed in a waterbath. The waterbath will be set up with approximately 5cm of sodium hydrogen carbonate solution that will help maintain a good supply of carbon dioxide. The water in the waterbath will have been left for a few days in the room the experiment will take place in, as it will therefore be at room temperature and will also be de-chlorinated, making this experiment a fair test by making sure it is at a constant temperature.

A waterweed shoot of about 5-10 cm long will be selected. A paperclip will be slid over the tip of the shoot, which will then be dropped into the waterbath, acting as a weight so the shoot is held underwater. A bench lamp with a 70-watt bulb will be switched on until the bulb has reached its maximum temperature, after which it will be brought 10 cm close to the waterbath. A jar will be placed in the waterbath, over the shoot. After approximately one minute, bubbles should appear from the cut end of the stem. When the bubbles are steadily appearing, the bench lamp will be switched off and any changes in the production of bubbles will be observed. The gas from the bubbles will be trapped under the jar and test will be done to check if the gas is oxygen by seeing if a glowing splint re-lights. After this has been done, the lamp will be placed 20 cm away from the waterbath for two minutes and the jar covering the waterweed will be removed as there will be no need for it. Once the lamp is switched on, a count of the bubbles will be made

by tapping a pen on a sheet of paper at the same rate the bubbles appear for about 15 seconds. This will be repeated when the lamp is 30 cm away from the waterbath.
Now, the bulb in the lamp will be changed to a 150-watt bulb and the experiment will be repeated in the same way so it is a fair test. It will start with a distance of 10cm with a jar over the waterweed to check if the gas given of by the plant is oxygen. Next, will be a distance of 20cm and then 30cm, as before, and each time the rate of bubble production will be noted.
So that the results are accurate, the experiment will be repeated three times. So that, overall, the experiment will be fair, the same amount of water and sodium hydrogen carbonate and waterweeds of the same size will be used. For safety measures, we will ensure that the bulbs and the water do not come into contact.

Diagram

Results Table

	EXPERIMENT 1		EXPERIMENT 2			EXPERIMENT 3			AVERAGE		
	70W	150W	70W	150W	bubble count	70W	150W	bubble count	70W	150W	bubble count
10CM											
20CM											
30CM											

Bibliography

My sources of research were: GCSE Biology text book by D.G Mackean
www.photosynthesis.com