

**Experiment to investigate the factors that affect the rate of photosynthesis in Elodea**

**Introduction**

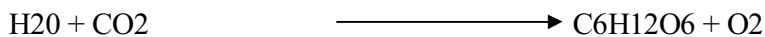
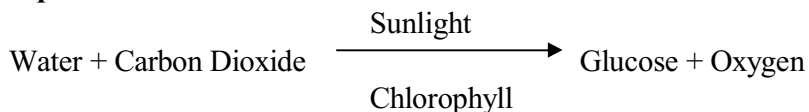
Photosynthesis is the process by which plants and some bacteria, and some which use the energy from sunlight to produce sugar, (glucose) which cellular respiration converts to ATP, (the fuel used by all living things). The conversion of unusable sunlight energy into usable chemical energy is associated with the actions of the green pigment Chlorophyll.

The variable I have used to carry out this experiment is Light Intensity

Light intensity is used to create energy, which then falls on the chloroplasts in a leaf, it is then trapped by the chlorophyll, which then makes the energy available for chemical reactions in the plant. In the case of light from a bulb, it falls on the plant, where energy is absorbed, therefore more energy is available for the chemical reactions, and so more photosynthesis takes place in a certain amount of time.

Other variables can be used such as: Temperature, Concentration of Carbon Dioxide, Wave length of light, nutrients available, amount of pond weed, and age of pond weed.

**Equation**



**Prediction**

I predict that the more intense the light, the faster the rate of photosynthesis will respire. When the light intensity increases (when the lamps distance gets closer), the rate of photosynthesis will increase at a proportional rate until a certain level is reached therefore the elodea will start to respire a lot faster. When the lamp is at a further distance the elodea will respire slower and when the lamp is at a closer distance the elodea will respire faster.

**Preliminary Test**

The quantities of materials I have used are:

200cm<sup>3</sup> of tap water

50ML of Sodium Hydrogen Carbonate in boiling tube

To determine a suitable range of distances at which to record results for my experiment, I recorded the number of bubbles of oxygen given off in a given time at various light intensities. To alter the light intensity, I placed a lamp at various distances from the plant, and then counted the amount of bubbles which were formed.

I changed the distance every 5cm, ranging until 25cm. I started from close up to the lamp slowly moving 5cm away, until I reached 25cm.

### **Outline Plan**

#### **Fair Testing**

Fair testing is that you make sure that the same sea weed is kept all the way throughout the experiment, to make sure that the tests were done 3 times for each distance, to make sure that the same amount of light intensity is used, and to make sure that the same amount of water is used in the water bath.

#### **Range of Measurements**

200cm<sup>3</sup> of tap water  
50ML of Sodium Hydrogen Carbonate

#### **Accuracy**

I will make sure that my experiments are accurate by using fair testing. I will test my results three times. I will also make sure that the same amount of measurements are used for each testing, therefore it will show that fair testing has been used.

#### **Safety**

Hot water  
Thermometer  
Dangerous Chemicals (Sodium Hydrogen Carbonate)

#### **List of Apparatus**

Lamp  
Boiling Tube  
Boiling Tube Rack  
Stop clock  
Beaker  
Clamp

**Detailed Method**

1. Firstly the boiling tube was filled with Sodium Hydrogen Carbonate and then the Elodea was placed in.
2. Next you create a water bath using 150cm<sup>3</sup> of tap water which leaves you with 19-20 degrees Celsius.
3. Then the boiling tube filled with Sodium Hydrogen Carbonate is placed inside the water bath
4. The boiling tube is then clamped with a clamp stand but still remaining in the water bath
5. The lamp was then placed 5cm away from the water bath
6. You then start your stop clock and leave it running for 10minutes and then the pond weed should start to form a reaction which starts to produce bubbles.
7. You then count the amount of bubbles formed within three minutes.
8. When you have completed those following steps you repeated them three times for each distance.
9. You use these five different distances which are: 5cm, 10cm, 15cm, 20cm, & 25cm.

**Diagram to show the method used**

**Results**

<b>Distance</b>	<b>Amount of Bubbles</b>			<b>Average</b>
	<b>1</b>	<b>2</b>	<b>3</b>	
<b>5cm</b>	48	56	61	55
<b>10cm</b>	22	31	59	37.33
<b>15cm</b>	23	23	24	54
<b>20cm</b>	13	11	10	27.33
<b>25cm</b>	9	7	18	18.66

## Conclusion

In Conclusion I found out that when the lamp is at a closer distance the pond weed will produce bubbles at a lot faster rate than when it is further away. At the distance of 5cm, more bubbles were being produced because of the light and the heat given from the lamp. At this distance it only produced forty-eight bubbles within three minutes. In the second and third testing of this distance, it increased by eight bubbles and then eleven bubbles more than the first, therefore my experiment was carried out accurately and very few errors were made.

The next distance I applied was 10cm. I found out that when the distance is closer the reaction takes place a lot slower, therefore this shows that a lot more Carbon Dioxide was generated and the amount of bubbles in the first experiment rather than the second. In the second experiment it had almost decreased by double the amount.

In the next distance which is 15cm, I found out that the amount of bubbles produced decreased dramatically, this is because each time the distance decreases the rate of reaction becomes slower therefore less bubbles are formed. 15cm is the optimum distance. I say this because the pond weed was reacting with the Sodium Hydrogen Carbonate at a smooth pace.

The next distance I used was 20cm. I found that the amount of bubbles produced started, had slowly started to come to a halt. From this point onwards the amount of bubbles started to decrease. This is because the pond weed Elodea started to lose the amount of input of light, therefore leaving it to respire very slowly.

The last distance I tested was 25cm. At this point very few bubbles were formed. As the amount of light started to decrease the amount of bubbles started to slow down, therefore leaving us with very few bubbles.

**Evaluation**

Overall, I would state the experiment as a success since my predictions were supported by my results. This is important in reflecting success only if my prediction was sensible and logical. Just as important is where the experiment was not a success and why. This photosynthesis investigation was probably not performed as accurately as it could have been due to some controllable and uncontrollable conditions. Some mistakes can be corrected.

While performing the experiment, the piece of pond weed did not photosynthesize at a steady rate, even when the distance from the plant to the light source was kept at a constant rate. The second reading at 10cm was far greater than the first reading at 5 cm. While the number of oxygen bubbles was being recorded, the rate at which the plant was photosynthesizing had increased several times. This may be due to the poor circulation of sodium hydrogen carbonate at the beginning of the experiment, nutrients which are not available, wave length of the light, amount of pond weed and age of pond weed.

Temperature was also another factor that was controlled by the lamp being used. The heat inside the laboratory would also vary, and also the heat outside.

All of the reasons given above evaluate what problems went wrong during my experiment.