

## REVISION: PHOTOSYNTHESIS

30 APRIL 2014



### Lesson Description

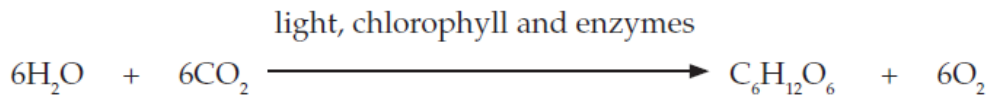
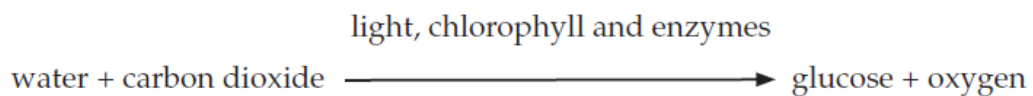
In this lesson, we will:

- revise the process of photosynthesis
- revise the various practicals testing photosynthesis



### Summary

#### Photosynthesis

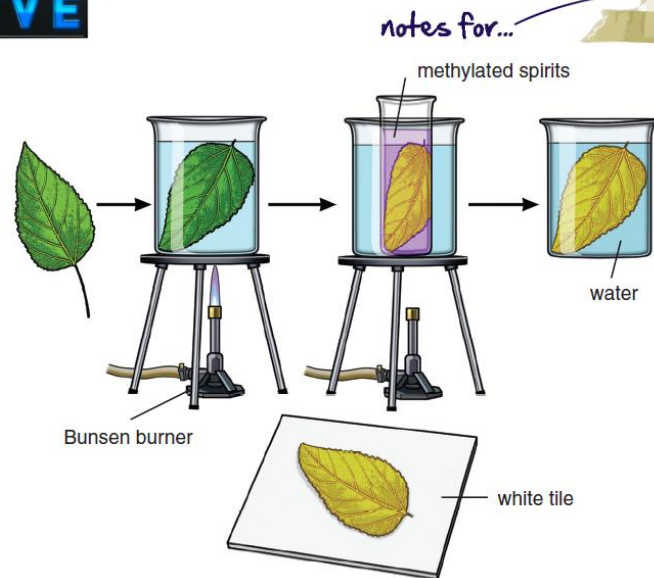


*(Solutions for all Life Sciences, Macmillan, p121)*

- Photosynthesis is a process whereby light is converted into chemical energy. Sunlight is changed into the chemical energy of sugars and other organic compounds. This process consists of a series of chemical reactions that require carbon dioxide (CO<sub>2</sub>) and water (H<sub>2</sub>O) and store chemical energy in the form of sugar.
- Photosynthesis occurs in the chloroplast. It is an anabolic process and requires enzymes.

#### Testing for the presence of Starch

- The first thing you need to be able to do is to test for starch. The test for starch goes as follows:
- You will need the following:
  - A beaker containing water
  - Tripod stand and wire gauze
  - Bunsen burner or spirit burner
  - Test tube containing methylated spirits
  - Forceps
  - White tile
  - Iodine solution
  - Dropper or pipette



(Solutions for all Life Sciences, Macmillan, p128)

### Method

- Remove a leaf from a healthy growing plant.
- Put the leaf in boiling water
- When the leaf has gone soft (flaccid) take it out of the water and put it into methylated spirits or ethanol. (Keep the spirits away from flame.)
- The chlorophyll will move out of the leaf and into the methylated spirits or ethanol.
- Remove the leaf from the methylated spirits and wash it in the boiling water.
- Put the leaf onto the white tile and flatten it out.
- Drop a few drops of iodine solution onto the leaf and watch for a colour change.



(<http://hazell11bio.blogspot.com/2013/03/photosynthesis.html>)

### Photosynthesis Practicals

#### Practical 1

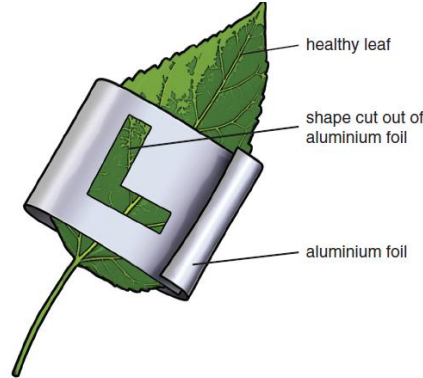
To determine whether light is necessary for photosynthesis

#### Requirements:

- Pot plant that has been kept in the dark for 48 hours
- Tin foil
- Scissors
- Starch test materials

**Method:**

- Cut a shape into a wide strip of tinfoil.
- Wrap the tin foil around the leaf with the shape on the top of the leaf. You don't have to cover the whole leaf.
- Leave the plant in the sun for several hours.
- After several hours remove the leaf from the plant and perform the starch test on it.



*(Adapted from Solutions for all Life Sciences, Macmillan, p129)*

**Practical 2**

To determine whether chlorophyll is necessary for photosynthesis

**Requirements:**

- Plant with variegated leaves left in the dark for 48 hours
- Starch test materials

**Method:**

- Remove the plant from the dark and put it into the sun for several hours.
- Perform the starch test on a leaf.



*(<http://landscaping.about.com/od/galleryoflandscapephotos/ig/variegated-leaves/variegated-maples.htm>)*

**Result:**

- There will be starch present where the green parts if the leaf were and no starch in the white areas.

### Practical 3

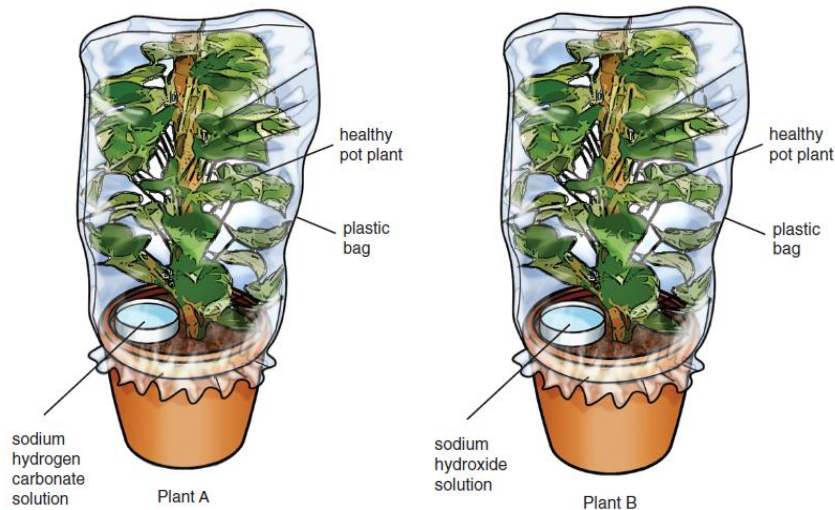
To determine whether carbon dioxide is necessary for photosynthesis

#### Requirements:

- 2 pot plants left in the dark for 48 hours
- Sodium hydroxide solution (NaOH)
- Sodium hydrogen carbonate solution (NaHCO<sub>3</sub>)
- 2 large plastic bags
- 2 elastics
- Starch test materials

#### Method:

- Remove the plants from the dark
- Place a container of sodium hydroxide on the soil of one plant.
- Place a container of sodium hydrogen carbonate on the soil of the second plant.
- Cover both plants with a plastic bag and secure with the elastics.
- Leave the plants in the sun for several hours.
- Remove a leaf from each plant
- Perform the starch test on each leaf.



(Adapted from *Solutions for all Life Sciences, Macmillan, p131*)

#### Result:

- The plant that had sodium hydroxide with it in the plastic bag will produce less starch.
- The plant that had sodium hydrogen carbonate with it in the plastic bag will produce more starch.

### Practical 4

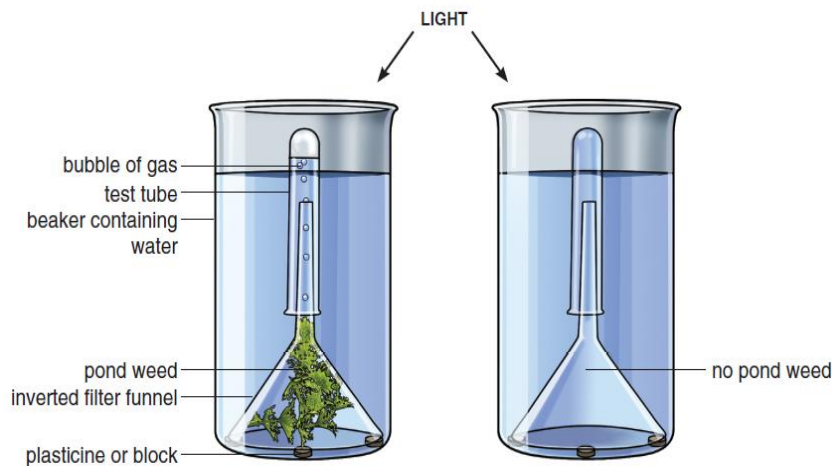
To determine whether oxygen is produced during photosynthesis

#### Requirements:

- Two beakers
- Water
- Two filter funnels
- Two test tubes
- Prestick
- Canadian pond weed (*Elodea*)
- 2 elastics
- A wooden splint
- matches

**Method:**

- Pour water into the two beakers
- Place the *Elodea* in one beaker
- Place the funnel upside down over the *Elodea* and use prestick to keep it above the bottom of the beaker
- Place a funnel upside down in the second beaker also slightly elevated
- Fill a test tube with water and close it with your thumb
- Place it over the top of the funnel
- Leave the beakers in the sun for several days
- After a few days remove the test tube from the *Elodea* and close it with your thumb
- Light a splint and blow it out.
- Remove your thumb from the top of the test tube and put the splint in.



(Adapted from *Solutions for all Life Sciences, Macmillan, p132*)

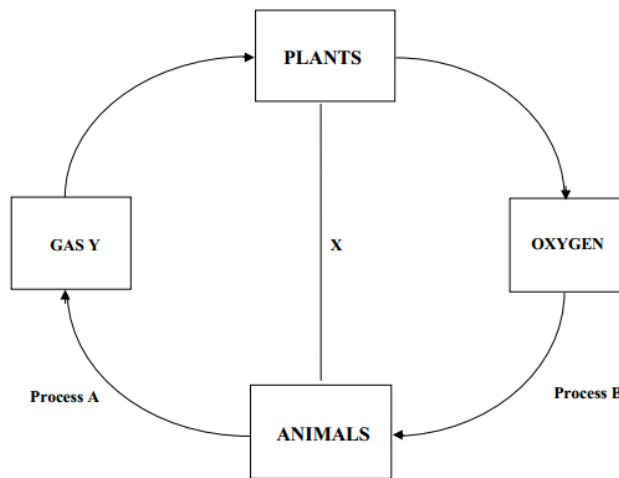
**Practical Write Up**

- **Investigative question** – this is the purpose of the investigation. The question we are trying to answer by completing the experiment.
- **Hypothesis** – the answer you expect to get from the investigation
- **Method and materials** – what you are going to use and how you are going to perform the experiment
- **Variables** –
  - **Independent** – the factor you are changing to answer your question
  - **Dependent** – the factor that changes because of what the Independent variable does (the answer to the question)
  - **Controlled** – the factor that can change but you make sure does not change at all during your experiment
- **Results** – what you have recorded as the answers to your Investigative question
- **Analysis** – an explanation of your results
- **Conclusion** – Drawing the whole practical together summarising the question, hypothesis and results.



**Improve your Skills**

**Question 1**



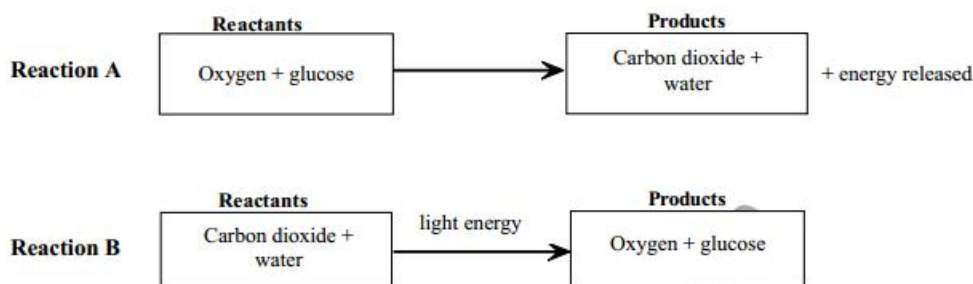
([http://chemactive.com/worksheets/gcse/biology/photosynthesis\\_questions.pdf](http://chemactive.com/worksheets/gcse/biology/photosynthesis_questions.pdf))

- 1.1 What is gas Y? (1)
- 1.2 Where does gas Y enter the plant? (1)
- 1.3 What do plants use gas Y for? (1)
- 1.4 In which process do animals use oxygen? (1)
- 1.5 Name process A and B. (1)
- 1.6 What does the arrow labelled X represent? (1)

**[6]**

**Question 2**

Look at these two reactions which take place in living organisms.

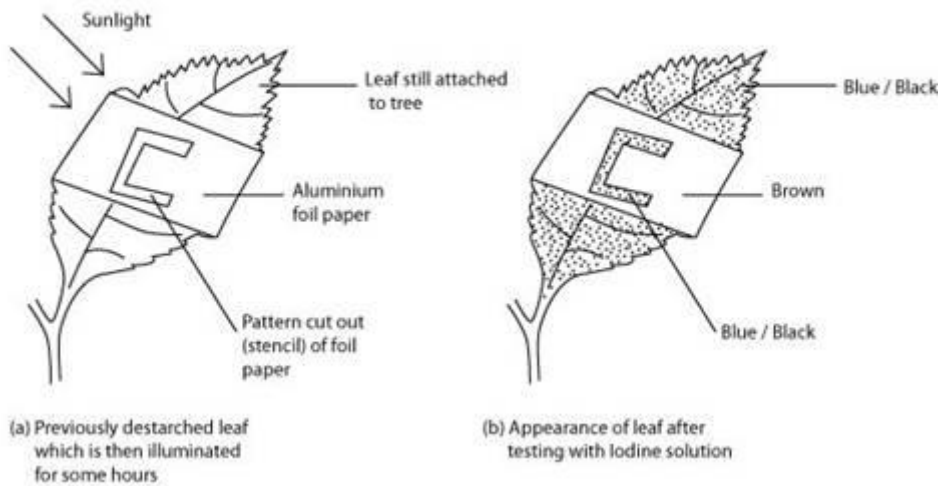


- 2.1 Which of the two reactions takes place in plants and animals? (1)
- 2.2 Which of the two reactions takes place only in plants? (1)
- 2.3 Which reaction represents photosynthesis? (1)
- 2.4 Name one substance used up in reaction A. (1)
- 2.5 Which of the two reactions can only take place in daylight? Give a reason for your answer. (2)
- 2.6 What is the source of the water in reaction B? (1)
- 2.7 What is the source of the glucose in reaction A? (1)

**Photosynthesis: The Practicals**

**Question 1**

TO SHOW THAT LIGHT IS NECESSARY FOR PHOTOSYNTHESIS



(<http://www.elateafrica.org/elate/biology/nutrition/structured2.jpg>)

- 1.1 What is an appropriate investigative question for this experiment? (2)
  - 1.2 Write an appropriate hypothesis for this experiment. (2)
  - 1.3
- Write down the following variables
- a) controlled (1)
  - b) independent (1)
  - c) dependent (1)
- 1.4 Write a suitable conclusion for this experiment. (3)



**Links**

- MindsetLearnXtra - <https://www.mindset.co.za/learn/xtra>
- Photosynthesis <http://biology.clc.uc.edu/courses/bio104/photosyn.htm>
- Biology4kids.com [http://www.biology4kids.com/files/plants\\_photosynthesis.html](http://www.biology4kids.com/files/plants_photosynthesis.html)
- The photosynthetic process [http://www.biology4kids.com/files/plants\\_photosynthesis.html](http://www.biology4kids.com/files/plants_photosynthesis.html)
- Centre for Bioenergy and Photosynthesis <http://photoscience.la.asu.edu/photosyn/education/learn.html>
- <http://www.reading.ac.uk/virtualexperiments/ves/preloader-photosynthesis-full.html>