

Planet Earth

Biodiversity and Interdependence

Our Interdependent World



Plants, Carbon
Dioxide and
Oxygen



Plants and
food



Food webs



Food Pyramids

In this lesson you...

... will learn more about the processes going on inside plants in sunlight. You will also appreciate more why plants are essential to all forms of life.

You will do this with a leaf , alcohol and iodine solution and find out about the process all living things depend on.

Additionally you..

... you will get more practice at working in groups, devising and setting up experiments, writing reports and coming to conclusions about the world we live in.

You will also see an example of how scientists use their previous knowledge to find new knowledge.

CofE Goal: I have collaborated on investigations into the process of photosynthesis and I can demonstrate my understanding of why plants are vital to sustaining life on Earth.

In lesson 1 we learned that the gas exchange in plants depends on whether it is light or dark.

Respiration is the process of releasing the energy from food.

What is the opposite of using up food to give us energy?

Using energy to produce food

What do you think we can investigate now?

Do green plants use the energy from sunlight to produce food inside them?

Testing for starch

The simplest food we can investigate is **starch**. Starch is a large insoluble molecule. (it does not even dissolve in strong solvents like alcohol)

Before we test for starch there are a couple of **problems** we must solve.

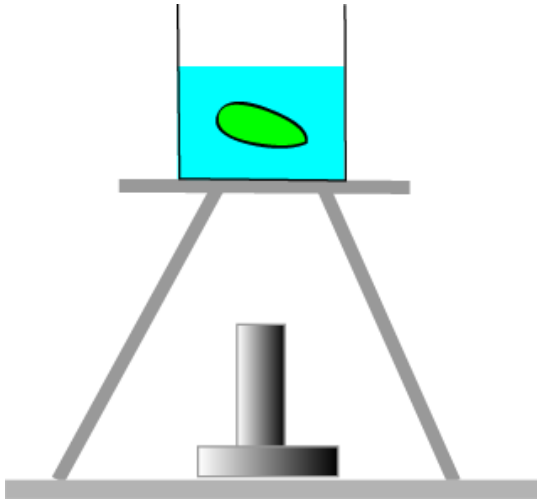
If there is starch inside a plant cell it will be securely **confined** within the cell wall and membrane of the plant. Also the **chloroplasts** that make the leaf green, will disguise the test for starch.

1. **Suggest** what we can do to a plant cell to **weaken** the cell walls and release starch.
2. **Suggest** what we can do to a plant cell to **remove** the green **chlorophyll**.

Spend five or so minutes thinking about this, before you get the details.

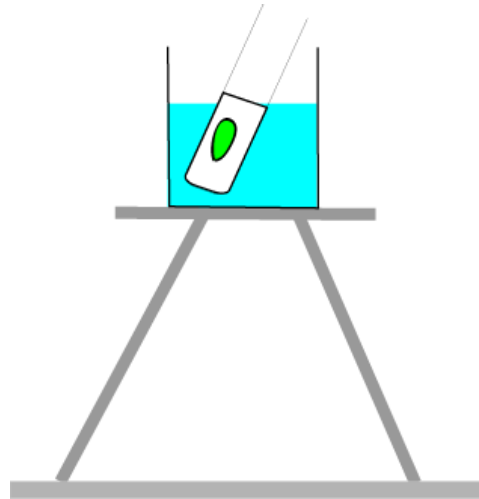
Testing for starch experiment

We are looking at an experiment to find out if plants build up food.



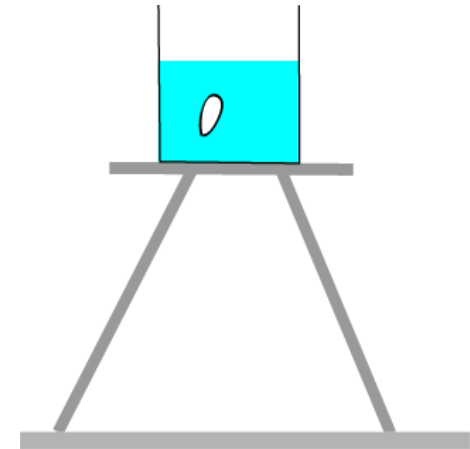
Boil half a beaker water. Put the leaf in and boil it for two minutes. Use tongs.

Remember your goggles!

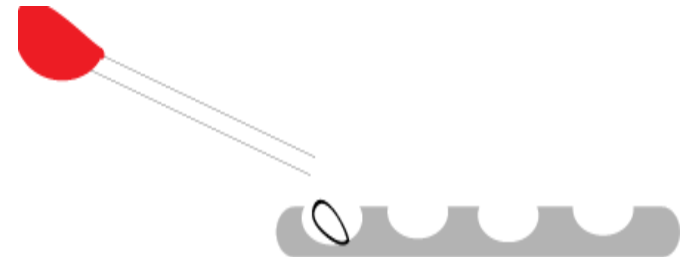


Switch Bunsen off. Put the leaf in a test tube of alcohol and put the test tube back in the hot water. Leave it for **five minutes** until the alcohol goes green

Put the leaf in a dimple tray and add a few drops of Iodine solution. What do you notice ?



Put the leaf in the hot water to soften the leaf and wash off the alcohol.



Green plants and the LIGHT

Now that we know that the green plant produces **STARCH** in **PHOTOSYNTHESIS**, we need to find out the **requirements**

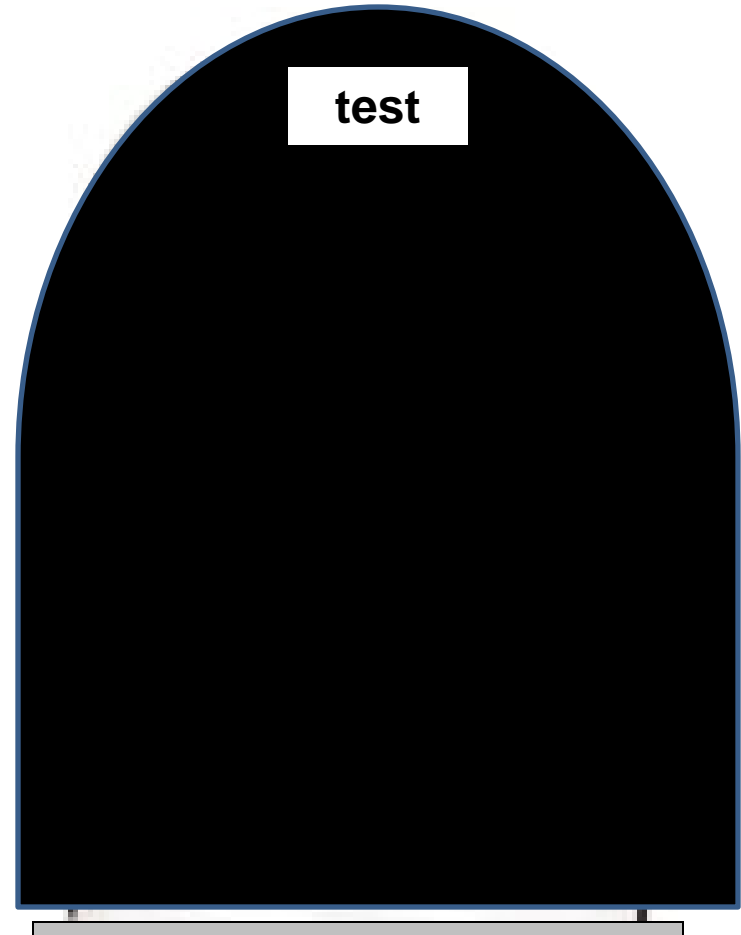
Experiment 1 Green plants and light

Aim: To find out if LIGHT is needed for photosynthesis.

- ✓ **Think** about an experiment you could do to find this out.
- ✓ Make a **hypothesis** and plan it .
- ✓ Show your **plan** to your teacher before carrying out the task.

Light

- The test plant is kept in **darkness**
- The control is given **light**
- Everything else stays the same



Now test **both** leaves for **starch**.

Result.

What did you find ?

Write a **conclusion** and then make a **comment** on whether your **hypothesis** was **correct** or if it needs to be **altered**.

Green Plants and Carbon dioxide

Experiment 2 : Green plants and CO₂

Now that we know that **light** is **required** for **photosynthesis**

Aim : to **investigate** if the **carbon dioxide** the plant takes in (when in the light) is involved in the making of starch.

- ✓ **Think** about an **experiment** you could do to find this out.
- ✓ Make a hypothesis
- ✓ Look at the apparatus shown on the next slide and then plan and carry out the experiment.

Carbon dioxide

- The **test** plant **lacks** carbon dioxide
- The **control** **has** carbon dioxide
- Everything else stays the same



Green plants and Carbon dioxide

Now test **both** leaves for **starch**.

Write the **result** and **conclusion** and **check** to see if your **hypothesis** is correct or if it should be altered.

Green Plants and Chlorophyll

We now know that **water** , **carbon dioxide** and **light** are needed for photosynthesis, but does the leaf need to be green to be able to carry out this process ?

The **green pigment** in a leaf is called **CHLOROPHYLL**.

Experiment 3 Green plants and chlorophyll

Aim: to investigate if **chlorophyll** is necessary for photosynthesis.

Your teacher will show you a **VARIEGATED** leaf .

Plan an experiment you could carry out using a **variegated** leaf to find out the answer. Remember to make a **hypothesis** .

Chlorophyll



- Use a plant with **variegated** leaves
- Variegated leaves have areas **with chlorophyll** and areas **without chlorophyll**
- Each area should be tested **separately**
- The **green** (chlorophyll) area is the **control**
- The **white** area (no chlorophyll) is the **test**

Green plants and chlorophyll.

Now test the **variegated** leaf for **starch**.

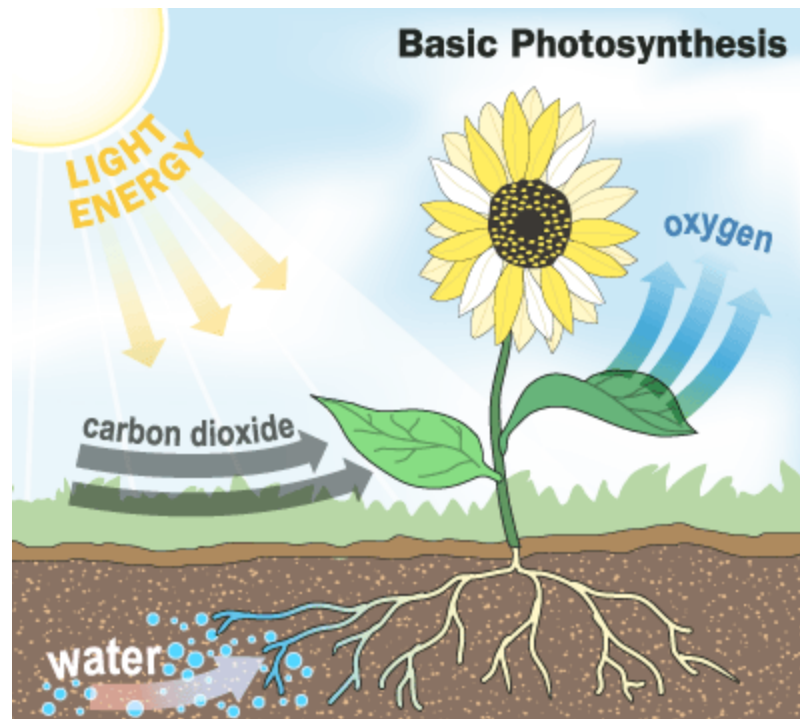
Write up your **experiment** to include the **result** and **conclusion** and check if your **hypothesis** is correct or if it should be changed.

What we learned

<http://www.twigonglow.com/films/photosynthesis-1186/>

Starch was in the leaf. This means starch is built up inside a plant using sunlight. This is called Photosynthesis.

The photosynthesis reaction is illustrated below. Look at it carefully and write down the two molecules taken in by the leaf to make starch (carbohydrate) and oxygen. Write a word equation for the reaction.



Carbon Dioxide + Water + (Sunlight) \longrightarrow Carbohydrate + Oxygen

Learning Square Questions

Plants and the Air

Plants and food

Upper Square

Write down a word equation for the photosynthesis reaction

Lower Square

Complete the diagram on your square showing what the leaf takes in and what it releases.