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Hello, I'm Dr Alex Lathbridge and this is Bitesize Biology.

This is the eighth episode in a nine-part series on the cell.

In this episode we're going to find out about photosynthesis, one of the most important processes to happen inside plants and one that changed life on Earth.

A few billion years ago, some early microscopic organisms that lived in water said:

"You know what, it would be really good if there was some way that we could use that big, burning ball of fire up in the sky, to keep ourselves alive. It would make it kind of easy for us to evolve into plants, that could live on land, that could grow tall, and release oxygen into the atmosphere so maybe complex lifeforms could exist. Maybe they could eat us? Just saying, it's literally right there."

And evolution said: "Yeah, I can't lie, that's actually a very good idea. Wait a couple of billion years."

I don't think you'll pass if you put that on the exam, so grab a pen and let's get into the ins and outs of photosynthesis.

Photosynthesis is how plants and algae make their own food by taking energy from the sunlight and using it to make a sugar called glucose.

They then use some of this glucose to make the larger, more complicated molecules they need to grow.

You'll need to remember the names of the things plants have to do this, so it's a good idea to make some notes or draw your own diagram.

Photosynthesis mainly happens in leaves of the plants.

Cells in plants have things called chloroplasts. Chloroplasts contain a chemical called chlorophyll, which is what they use to absorb light from the sun.

Easy way to remember: chloroplasts are filled with chlorophyll.

Fun fact: chlorophyll is what gives plants their green colour and if you look at the chemical structure of chlorophyll, it looks like a flyswatter.

The main place that you will find chloroplasts are in two types of cells with weird names:

Palisades and spongy mesophyll cells.

As well as light from the sun, plants need two other things for photosynthesis:

They need carbon dioxide; they take this from the air through holes in the leaves called stomata.

And they need water, which they get from the soil and is transported through the plant by its plumbing system - the xylem. (And if the word xylem doesn't ring any bells, go back and listen to Episode 3 for a bit more info.)

So, plants take light from the sun and use its energy to convert carbon dioxide and water into glucose, a sugar.

They also use this energy to make molecules such as cellulose, for cell walls, starch for storage, and amino acids to make proteins.

Humans can't perform photosynthesis. We don't have any chloroplasts or chlorophyll, so we aren't able to convert light from the sun into chemical energy.

However, it's still good news for us that plants photosynthesise because plants store some of the energy in the form of glucose inside the plant and when you eat that you get the energy. Which makes eating lettuce a lot more interesting.

There is an equation for photosynthesis that you are going to need to remember so write this down:

Carbon dioxide + water is converted into glucose and oxygen.

Or $6CO_2 + 6H_2O \rightarrow C_6H_{12}O_6 + 6O_2$

Six carbon dioxide molecules plus six water molecules is converted into a glucose molecule, plus six oxygen molecules.

When I say converted, when you're writing an equation you show a long right arrow.

This is an endothermic reaction, what that means is that it absorbs energy from the environment to make it happen. The easy way to remember this is that the sun gives off a lot of heat for the plant to use.

There are three factors that are important when it comes to the rate of photosynthesis:

The amount of carbon dioxide.

The heat of the environment

And the amount of light.

These three factors affect the rate of photosynthesis, which means that if any of these factors aren't at the right level, it can slow down photosynthesis and then it becomes the limiting factor.

If there's lots of light and a high concentration of carbon dioxide, but it's still going slowly, chances are that temperature is to blame.

If the temperature is fine, and there's lots of carbon dioxide, chances are there's not enough light. So, the limiting factor can change.

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