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| Topic Thumbnail | <https://thumbs.dreamstime.com/b/photosynthesis-vector-diagram-photosynthesis-vector-diagram-kids-136509219.jpg> (Do not add any text) |

**Checklist**

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| --- | --- |
|  | Image headings |
|  | Image text- spellings, case, elements |
|  | Image instructions |
|  | Headings of Slides ; Title case |
|  | Content coverage |
|  | End questions |
|  | Spell-Check; UK Spellings |
|  | Language check |
|  | Thumbnail links |
|  | Connecting lines, introductory lines |
|  | Meanings in form of ‘phrase’ in WB & TTR |
|  | Clear the Myth |

**Plag Score:** 10%

**Flesch score:** 60

**Chapter - Nutrition in Plants**

**Types of Nutrition**

“**We are what we eat**” is a well-known saying. It means that if one eats healthy food, one stays in good health. Food is an important part of our lives. The process of consuming and using that food for growth and development is known as **nutrition**. Food that we eat includes **nutrients** like carbohydrates, proteins, fats, minerals, and vitamins. Animals are unable to make food for themselves. Humans can make various delicacies,but we need vegetables, meat, or eggs to make our food. .

<https://concept-stories.s3.ap-south-1.amazonaws.com/test/Stories%20-%20Images_story_123104/image_2020-10-20%2013%3A12%3A12.587099%2B00%3A00>

[Include all the labels that are in the image, except for the - five major nutrients][Add label: Types of Nutrients]

Plants, on the other hand, can make food for themselves. It is used by them to carry out various functions. Animals use plants as a source of food. Hence, there are two types of organisms. The ones who can make their food, known as **autotrophs,** and those who cannot make their foordareknown as **heterotrophs**. The mode of nutrition in autotrophs is **autotrophic** (*auto* = self; *trophos* = nourishment). The mode of nutrition in heterotrophs is **heterotrophic** (*heteros* = other).

Let us now learn more about autotrophs and heterotrophs.

<https://study.com/cimages/multimages/16/autotroph_heterotroph_diagram.png>

[Add label: Types of Organisms]

**Information Box**

Autotrophs are also known as **producers** as they produce food for themselves. The heterotrophs are organisms that consume the food made by the producers, they are known as **consumers**.

<https://prnt.sc/xcjmmn>

**More about Autotrophs and Heterotrophs**

**Autotrophs**

<https://www.shutterstock.com/es/image-vector/photosynthesis-diagram-nice-red-flower-1644596845>

[Include all the labels in the image][Start all the labels with a capital letter – For example: Sunlight, Carbon dioxide, etc.]

Autotrophs make food for themselves from simple substances, like water and carbon dioxide. All green plants are autotrophs. They have a green pigment, **chlorophyll,** which helps in making food. We already know that this process is known as **photosynthesis**. It can be broken into ‘***photo* =light*’*** and ‘***synthesis* = formation.*’***

During this process, light energy (usually from Sun) is absorbed by the chlorophyll and is used to convert water, carbon dioxide, and minerals into **oxygen** and **sugars** (carbohydrates).

Humans and other living beings that do not have chlorophyll are unable to make food for themselves. Hence rely on plants for nutrition.

**Heterotrophs**

[**https://prnt.sc/w8960r**](https://prnt.sc/w8960r)

**[Add label : Heterotrophs]**

Heterotrophs cannot make food for themselves and are **dependent on the producers** for nutrition. All non-green plants and animals are heterotrophs. These lack chlorophyll and hence, are unable to perform photosynthesis. Examples of heterotrophs include animals, most bacteria, and fungi.

Before going into more details of photosynthesis, let us understand briefly about the plant cells.

**Plant Cells**

<https://prnt.sc/w88uo5> [Label: Plant Cell]

All living things are made up of tiny structures called **cells**. Even our body is made up of trillions of cells. Plants are also made up of these tiny structures. A plant cell itself has many small components, which we need not worry about for now, but we can read about the basic ones. These are-

1. **Cell wall and Cell membrane**: These are outer coverings of the plant cell. They help to maintain the shape of the plant cell and protect it from any physical damage.
2. **Cytoplasm**: This is the liquid that fills the plant cell. All the other cell components are suspended in this liquid.
3. **Nucleus**: It is the controlling section of the cell that commands the cell what to do.
4. **Chloroplast**: This is the main section of the plant cell where the process of photosynthesis takes place.

Now that we have learnt about plant cells. Let us understand more about the process by which plants make their food.

**Process of Making Food**

<https://prnt.sc/w6wg7s> **[make in stages, like 3 images, 1 for each step]**

**In step 1 show – Text along number 1 and minerals and water entering the plants.**

**In step 2 show – Text along with number 2 and carbon dioxide and oxygen coming in and going out.**

**In step 3 show – Text along with number 3 and sunlight**

**Photosynthesis** **is a process of making food** (carbohydrates or simply sugars) from simpler substances (carbon dioxide, water, and minerals) in the presence of light and chlorophyll. Plants take in water and minerals from the soil and carbon dioxide from the air. Carbon dioxide and water combine in the presence of **sunlight** and **chlorophyll** to make glucose and oxygen. Glucose is a simple sugar that is then converted into a complex compound, like **starch**.

We can even write an equation for this process, just like we do in math. Swipe down to find out. In fact, photosynthesis is a good example of a chemical reaction, where raw materials combine to form products.

<https://qph.fs.quoracdn.net/main-qimg-4bfc1b8c0d066f64fdc041467930cbc0>

[Add label: Word Reaction for Photosynthesis][Start all the components of the reaction with a capital letter]

The green pigment chlorophyll is the factor that carries out this process. So the part of the plant that is green in colour is responsible for photosynthesis, and these are leaves. So, we can say that leaves are the **site for photosynthesis**. Is there anything special in the leaves that makes them capable of photosynthesis? Let us find out.

**Did you know?**

<https://prnt.sc/w71js1>

[Add label: Change of Colour with Seasons][Write the labels as Chlorophyll, Summer, Fall, Winter, Spring]

Water and sunlight are harder to come during winters in colder areas. Less sunlight leads to lower rates of photosynthesis. That is why leaves change their colour in autumn to yellow because plants do not make much chlorophyll during that time.

**Site of Photosynthesis: Chloroplast**

<https://prnt.sc/w6xjwy>

[Add label: Structure of Leaf][Write the labels as: Chloroplast, Air space, Stoma, Guard cell]

Photosynthesis majorly takes place in leaves. But it can also take place in green stems and green branches of the plants. Plant cells have a special component, **chloroplasts,** in them, which contain structures known as **grana**. The grana have chlorophyll pigment in them. Chlorophyll is present in the leaves, and roots take up the water and minerals through the roots. But what about the gases? Leaves have an arrangement for that as well.

**Nose of the Plant: Stomata**

[**https://prnt.sc/xcrqi3**](https://prnt.sc/xcrqi3)

**[Add label: Stomata][**Write the labels as: Opened stomata, Closed stomata, Guard cells**]**

Leaves have porous structures in them that allow the exchange of gases. These pores are known as **stomata,** and the cells lining or guarding the pores are known as **guard** cells. These cells control the opening and closing of the stomata.

Water and minerals are absorbed from the soil through the roots. The water flows to the leaves through a series of interconnected pipe-like networks known as **xylem**.

We have now learnt the process and site for photosynthesis. But are there any conditions necessary for photosynthesis? Let us find out.

**Conditions Necessary for Photosynthesis**

https://prnt.sc/w890b5

[Add labels: Conditions Necessary for Photosynthesis][Write the labels as: Sunlight, Chlorophyll, Carbon dioxide, Water and dissolved minerals]

1. ***Sunlight***

During photosynthesis, plants need light energy. Sunlight is the source of this energy.

1. ***Chlorophyll***

It is the green pigment that traps light energy and converts it into glucose (sugar).

1. ***Carbon dioxide***

It serves as the raw material for this process. The plants absorb Carbon dioxide from the air through stomata (*singular*: *stoma*).

1. ***Water and minerals***

Water is another raw material for this process. Roots absorb water along with minerals from the soil.

Once photosynthesis has taken place, and glucose is formed, then what is the next step? Let us learn about the fate of glucose.

**Fate of Glucose**

**https://prnt.sc/12u7xzh**

[Add label: Fate of Glucose]

Photosynthesis forms glucose that changes into other substances inside the plant leaves. It is converted into **starch** that provides energy to the plant. Glucose also converts into other useful substances like **proteins**, **vitamins,** and **fats**. Proteins help in making the structures of the cell. Vitamins help in many chemical reactions taking place in the cell. Fat acts as a natural storehouse of energy. Glucose is also converted into other sugars that are present in fruits. Glucose is a source of energy for various functions of plants.

Theformation of proteins requires something else in addition to glucose. They require nitrogen. Nitrogen is absorbed by the plants with the help of certain bacteria. These are known as nitrogen-fixing bacteria. *Rhizobium* is an example of one such bacteria.

**Coloured Leaves**

[**https://www.shutterstock.com/es/image-photo/different-colorful-leaves-isolated-on-white-363936053**](https://www.shutterstock.com/es/image-photo/different-colorful-leaves-isolated-on-white-363936053)

[Add labels: Coloured Leaves]

We observe leaves with different colours around us. Some are red, some are yellow, while some are violet. These leaves also have chlorophyll in them and can carry out photosynthesis. It is just that the different colour pigment suppresses the green colour of the chlorophyll.

There are some other members other than plants that are capable of making food for themselves. Let us read about these autotrophs.

**Other Autotrophs: Algae**

[**https://prnt.sc/w6yne4**](https://prnt.sc/w6yne4)

**[Add label: Algae]**

Algae are the green mass one sees in any stagnant water body. Algae are aquatic organisms that contain chlorophyll. Just like plants, they can also carry out photosynthesis. Although they look like plants, they are a different group of organisms.

**Clear the Myth!!**

<https://previews.123rf.com/images/mything/mything1709/mything170900058/86155158-superfood-fruit-kelp-grass-and-powder-spirulina-vector-illustration-cartoon-flat-icon-isolated-on-wh.jpg> [Add label: *Spirulina* – Superfood]

Algae acts as a liver toxin when consumed.

*Spirulina* a type of blue-green algae causing liver toxicity is a myth. Organic algae that are grown in controlled environments is used as a superfood and protein supplement. It offers many health benefits.

**Let's keep the grey cells ticking by answering the below!**

1. Which sugar is formed as a result of photosynthesis?

Glucose is formed as a result of photosynthesis.

1. Are algae types of plants?

Algae are not plants. Theylook green like plants due to the presence of photosynthetic pigments.

1. What is xylem?

Xylem is a type of transport tissue in plants. The basic function of the xylem is to transport water and minerals from roots to stems and leaves.

1. Can photosynthesis take place in artificial light?

Photosynthesis can take place in artificial light.

1. What is a pigment?

A pigment is a substance produced by living organisms, and it has a special colour.

**Word buddy**

**Stagnant** - Non-flowing water

**Delicacies** – Food item that is relished widely

**Terms to Remember**

**Autotrophs –** Organisms that can produce their own food

**Heterotrophs** – Organisms that cannot manufacture their own food

**Photosynthesis** – Process by which plants and other organisms convert light energy to chemical energy