

## Key Terms

- Absorbed** - When a substance is taken in by something or moved across a barrier such as a cell membrane.
- Bacteria** - Single-celled microorganisms, some of which are pathogenic.
- Bile** - A substance produced in the liver which aids digestion.
- Capillary** - Tiny blood vessels with walls one-cell thick where exchange of materials occurs.
- Catalyst** - a substance that increases the rate of a chemical reaction without itself undergoing any permanent chemical change.
- Insoluble** - Unable to dissolve in a particular solvent. For example, sand is insoluble in water.
- Soluble** - Able to dissolve in solvent. For example, sugar is soluble in water because it dissolves to form sugar solution.
- Villi** - Finger-like projections in the small intestine that provide a large surface area for the absorption of food.

## Biological Molecules

- A **nutrient** is a substance which is needed for growth, repair and **metabolism**. The three main nutrients are:
- Carbohydrates**  
Carbohydrates are digested in the **mouth, stomach and small intestine**. Carbohydrase enzymes break down starch into sugars. The saliva in your mouth contains amylase, which is another starch digesting enzyme. If you chew a piece of bread for long enough, the starch it contains is digested to sugar, and it begins to taste sweet.
- Proteins**  
Proteins are digested in the **stomach and small intestine**. Protease enzymes break down proteins into amino acids. Digestion of proteins in the stomach is helped by **stomach acid**, which is strong hydrochloric acid. This also kills harmful **microorganisms** that may be in the food.
- Lipids (fats and oils)**  
Lipase enzymes break down fat into fatty acids and glycerol. Digestion of fat in the **small intestine** is helped by **bile**, made in the liver. Bile breaks the fat into small droplets that are easier for the lipase enzymes to work on. Bile is not an enzyme.

## What is Digestion?

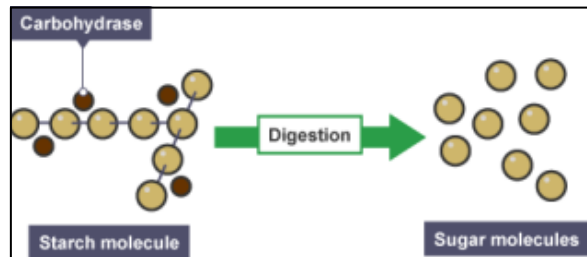
- The **digestive system** is made up of a group of organs that work together to break down food. This is where digestion takes place.
- During **digestion** larger insoluble food molecules are broken down into smaller soluble ones with the help of enzymes.
- These molecules are transported around our body to be used for energy, growth and repair.
- The opposite of digestion is egestion.
- Egestion** is the process of passing out food that has not been digested, as faeces.

## Enzymes

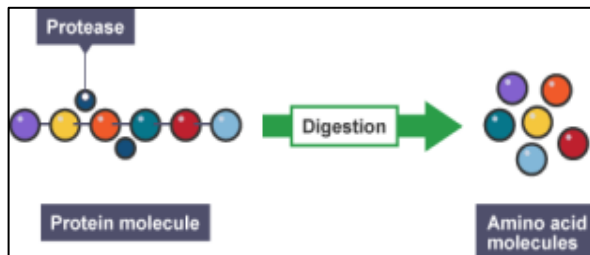
Enzymes are not living things. They are just special proteins which catalyses a chemical reaction by breaking large molecules into small molecules. Different types of enzymes can break down different nutrients

## Types of Enzymes

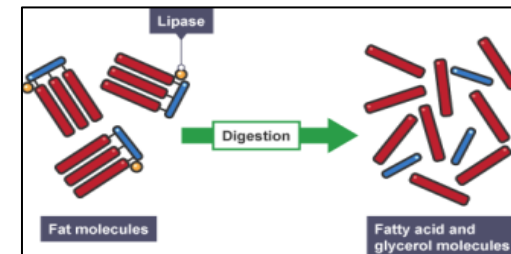
**Amylase** and other **carbohydrase** enzymes break down **starch** into **sugar**



**Protease** enzymes break down **proteins** into **amino acids**.



**Lipase** enzymes break down **lipids** (fats and oils) into **fatty acids** and **glycerol**.



## Photosynthesis

- **Photosynthesis** is a chemical reaction that takes place inside a plant, producing food for the plant to survive.
- **Carbon dioxide, water and light** are all needed for photosynthesis to take place.
- Photosynthesis happens in the **leaves** of a plant.

This is the word equation for photosynthesis:



This is the symbolic equation for photosynthesis:



## Factors Affecting Photosynthesis

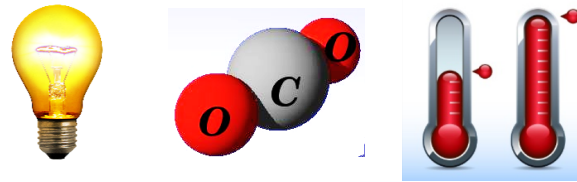
Several factors can affect the rate of photosynthesis:

- light intensity
- carbon dioxide concentration
- temperature

To measure the rate of photosynthesis in the lab, you can measure :

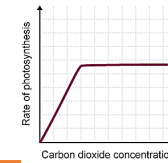
- the rate of **oxygen** output
- the rate of **carbon dioxide** uptake
- the rate of **carbohydrate** production

These are not perfect methods as the plant will also be respiring, which will use up some oxygen and carbohydrate and increase carbon dioxide output.



## Carbon Dioxide Concentration

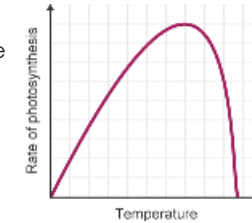
Carbon dioxide is one of the reactants in photosynthesis. If the concentration of carbon dioxide is increased, the rate of photosynthesis will therefore increase until there is a limiting factor.



## Temperature

Photosynthesis is an enzyme controlled reaction. Therefore, the rate of photosynthesis is affected by temperature.

At low temperatures, the rate is limited by the number of molecular collisions between enzymes and substrates. At high temperatures, enzymes are **denatured**.



## Light Intensity

Without enough light, a plant cannot photosynthesise very quickly - even if there is plenty of water and carbon dioxide and a suitable temperature.

Increasing the light intensity increases the rate of photosynthesis, until some other factor – **a limiting factor** – becomes in short supply.

At very high light intensities, photosynthesis is slowed and then inhibited, but these light intensities do not occur in nature.

