

Key Terms

- 1. Balanced diet** A diet that contains the correct amounts of all the necessary nutrients required for healthy growth and activity.
- 2. Carbohydrate** Food belonging to the food group consisting of sugars, starch and cellulose. Carbohydrates are vital for energy in humans and are stored as fat if eaten in excess. In plants, carbohydrates are important for photosynthesis.
- 3. Deficiency** In the diet, a deficiency happens if there is too little of a particular nutrient.
- 4. Diet** The type and amount of food consumed by people.
- 5. dietary fibre** The part of food that cannot be digested. It is also called roughage.
- 6. Lipid** Fat or oils, composed of fatty acids and glycerol.
- 7. Minerals** Naturally occurring, inorganic chemical substances. Minerals are necessary for both plant and animal health.
- 8. Protein** Organic compound made up of amino acid molecules. One of the three main food groups, proteins are needed by the body for cell growth and repair.
- 9. Vitamins** Organic substances which are essential in small amounts to regulate the metabolism and maintain the immune system.

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.

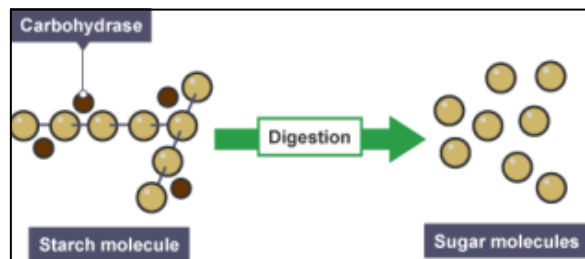
Egestion is the process of passing out food that has not been digested, as faeces.

Enzymes

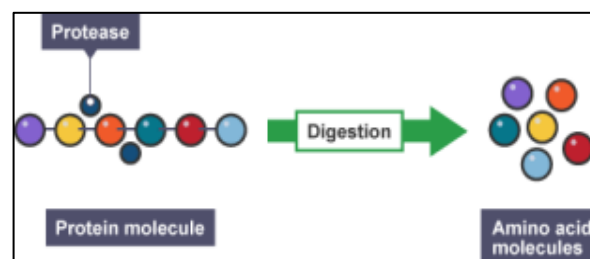
Enzymes are not living things. They are just special proteins which catalyses a chemical reaction by breaking large molecules into small molecules. Different types of enzymes can break down different nutrients

Types of Enzymes

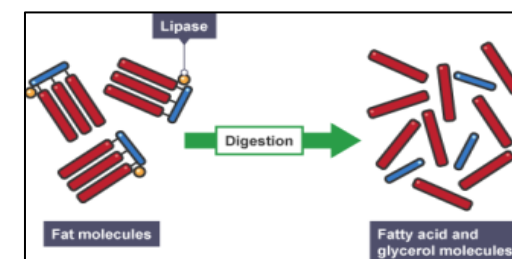
Amylase and other **carbohydrase** enzymes break down **starch** into **sugar**



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



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



Key Terms

balanced chemical equation - A chemical equation written using the symbols and formulae of the reactants and products, so that the number of units of each element present is the same on both sides of the arrow.

Bond - The chemical link that holds molecules together.

Catalyst - A substance that changes the rate of a chemical reaction without being changed by the reaction itself.

Combustion - The process of burning by heat.

complete combustion - Burning in a plentiful supply of oxygen or air. Complete combustion of a hydrocarbon produces water vapour and carbon dioxide.

Endothermic - Reaction in which energy is taken in.

Exothermic - Reaction in which energy is given out to the surroundings. The surroundings then have more energy than they started with so the temperature increases.

Fuel - Material that is used to produce heat, like coal, oil or gas.

Hydrocarbon - A compound that contains hydrogen and carbon only.

incomplete combustion - Burning when there is a limited supply of air or oxygen.

Limewater - Calcium hydroxide solution. It turns milky in the presence of carbon dioxide.

Neutralise - To be made neutral by removing any acidic or alkaline nature.

Oxidation - The gain of oxygen, or loss of electrons, by a substance during a chemical reaction.

Product - A substance formed in a chemical reaction.

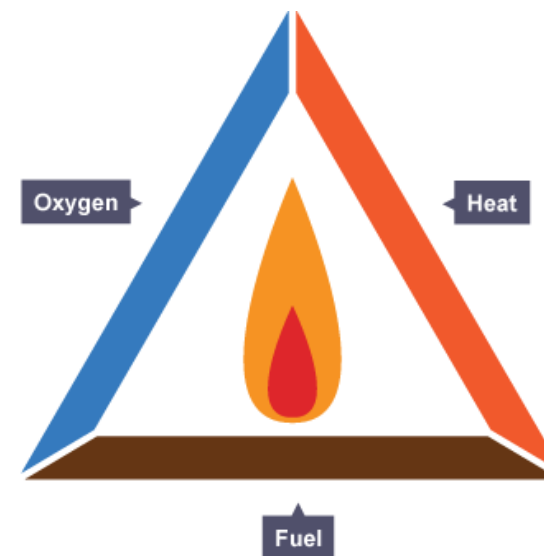
Reactants - Substances present at the start of a chemical reaction.

thermal decomposition - Type of reaction in which a compound breaks down to form two or more substances when it is heated.

Combustion Reactions

Combustion is another name for burning. It is an example of an exothermic reaction, a reaction that releases energy to the surroundings. This is mostly thermal energy, but light energy and sound energy are also released. Note that some other reactions are endothermic reactions – they take in energy from their surroundings. The fire triangle shows the three things needed for a fire to start and keep going.

A fire needs a fuel, oxygen (or air), and heat. If one of the sides of the fire triangle is removed, a fire will not start, and a fire that is already burning will go out. Fire-fighting relies on this principle. The fire will go out when the fuel runs out, but it is often unsafe to leave a fire that long. Different types of fires need to be tackled in different ways.



Complete Combustion

Coal, oil and natural gas are fuels that are widely used. They contain hydrocarbons, which are compounds of hydrogen and carbon only. When the fuel burns, its hydrocarbons react with oxygen. If there is plenty of air, complete combustion happens:

- the hydrogen atoms combine with oxygen to make water vapour, H_2O
- the carbon atoms combine with oxygen to make carbon dioxide, CO_2
- the maximum amount of energy is released

Natural gas is mostly methane, CH_4 . Here are the equations that model its complete combustion:
 methane + oxygen → water + carbon dioxide
 $CH_4 + 2O_2 \rightarrow 2H_2O + CO_2$

Incomplete Combustion

If there is not enough air or oxygen for complete combustion, incomplete combustion happens instead. Water vapour and carbon dioxide are still produced, but two other products are also produced:

- carbon monoxide, CO , a colourless toxic gas
- particles of carbon, which appear as soot and smoke, and which cause breathing problems