2.2.1

Nutrients

THE COMPOSITION OF FOOD

Most foodstuffs are composed of many different nutrients. These nutrients all have very defined roles and must all be provided in what we eat. Nutrients are chemical molecules principally made up of carbon, hydrogen, oxygen and nitrogen atoms. For example, water is comprised of hydrogen and oxygen, hence the chemical formula H_2O.

PROTEINS

Proteins are large molecules formed by a chain of amino acids. There are 20 amino acids. These 20 include 8 which are known as 'essential' amino acids as the body cannot produce them. They therefore have to be provided by what we eat.

LIPIDS

Lipids consist of fatty acids. Like amino acids, there are 'essential' fatty acids. The body is unable to synthesise them, despite the fact that they are essential for brain development. We can distinguish between ‘saturated’ and ‘unsaturated’ fatty acids.

Unsaturated fatty acids are liquid at room temperature. They are found in vegetable oils. Saturated fatty acids are solid at room temperature. They are found in solid animal and vegetable fats such as butter and coconut oil.

Keywords > Unsaturated fatty acids: vegetable oils
Keywords > Saturated fatty acids: solid animal or vegetable fats

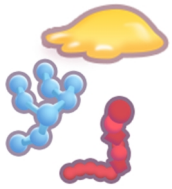
CARBOHYDRATES

Like fats, carbohydrates are made up of carbon, hydrogen and oxygen. We distinguish between ‘simple’ and ‘complex’ carbohydrates.

Fructose and glucose are simple carbohydrates. Starch and fibre are complex carbohydrates – which means they are made up of several simple carbohydrates. The digestive system can split starch into simple carbohydrates, which can be absorbed. However, we are not able to digest fibre, so it regulates the intestines.

Keywords > Simple carbohydrates: fructose, glucose
Keywords > Complex carbohydrates: starch, dietary fibre

MACRONUTRIENTS



We call all these molecules macronutrients. However, to assimilate and use these macronutrients, the body needs what we call micronutrients.
Keywords > Macronutrients: proteins, fats, carbohydrates
Keywords > Micronutrients: vitamins, minerals

Vitamins and minerals are examples of micronutrients that are vital for the body to function correctly.

VITAMINS

Vitamins are made up of a variety of elements. They are vital to us but only needed in small amounts. They are present in most unprocessed food, yet not every vitamin is available in every kind of food.

For example, vitamin C is primarily available in fruit and vegetables while vitamin B12 is only available in food coming from animals. By eating food from all of the food groups we are more likely to cover all of our vitamin requirements.
Keywords > Vitamin C: fruit and vegetables
Keywords > Vitamin B12: animal-based food

MINERALS

Minerals are inorganic elements. Some are present in large quantities in the body. These are called macroelements. Others are only present as traces and so we call them oligo-elements or simply trace elements.

Calcium and potassium are examples of macroelements, whereas iron and fluoride are oligo-elements.
Keywords > Macroelements: calcium, potassium
Keywords > Oligo-elements: iron, fluoride

DIGESTIX

This online course is connected to a game called DIGESTIX. This game features proteins, carbohydrates and fats, i.e. the macronutrients. To be absorbed by the body, these must be converted into simpler elements like amino acids or fatty acids. Micronutrients such as vitamins and minerals are also featured in DIGESTIX but, unlike macronutrients, they can be absorbed directly by the body.

2.2.1
Nutrients

What are nutrients?

- O Molecules
- O Food
- O Cells

What are the main macronutrients?

- O Lipids, carbohydrates, proteins
- O Lipids, carbohydrates, enzymes
- O Lipids, endives, proteins

Sodium is a...

- O macronutrient
- O micronutrient
- O trace element

What is the chemical formula for water?

- O HO2
- O H2O
- O O2H

What do proteins comprise?

- O Anaemic acids
- O Animated acids
- O Amino acids

The human body can produce all the amino acids it needs.

- O True
- O False

Lipids help the brain develop.

- O True
- O False

Which of these foodstuffs contain the most vitamin C?

- O Meat and fish
- O Fruit and vegetables
- O Cereals

Vitamin B12 can often be found in plant-based food.

- O True
- O False

Which of these minerals are trace elements?

- O Iron and fluoride
- O Calcium and potassium
- O Herculaneum and petroleum

Answers

What are nutrients?

- ● **Molecules**
  Well done! Nutrients are chemical molecules.
- ○ **Food**
  Wrong! Food contains nutrients.
- ○ **Cells**
  Wrong! Try again!

What are the main macronutrients?

- ● **Lipids, carbohydrates, proteins**
  Well done! These macromolecules have nutritional properties.
- ○ **Lipids, carbohydrates, enzymes**
  Wrong! Enzymes are not nutrients.
- ○ **Lipids, endives, proteins**
  Wrong! Endives contain macronutrients.

Sodium is a...

- ○ **macronutrient**
  Wrong! Sodium is not a macronutrient.
- ● **micronutrient**
  Well done! That's right!
- ○ **trace element**
  Wrong! Your body contains a large amount of sodium.

What is the chemical formula for water?

- ○ **HO2**
  Wrong! Try again!
- ● **H2O**
  Well done! That's right. Water is made up of 2 hydrogen atoms and 1 oxygen atom.
- ○ **O2H**
  Wrong! That's not the right answer.

What do proteins comprise?

- ○ **Anaemic acids**
  Wrong! Try again!
- ○ **Animated acids**
  Wrong! That was a trick answer.
- ● **Amino acids**
  Well done! Proteins consist of a sequence of amino acids.

The human body can produce all the amino acids it needs.

- ○ **True**
  Wrong! That's not the right answer.
- ● **False**
  Well done! Your body cannot produce 8 of the 20 amino acids it requires, so you need to get them from food.

Lipids help the brain develop.

- ● **True**
  Well done! Lipids play several roles, one of which is to provide the fatty acids that are essential for your brain to develop.
- ○ **False**
  Wrong! That's not the right answer.

Which of these foodstuffs contain the most vitamin C?

- ○ **Meat and fish**
  Wrong! Try again!
- ● **Fruit and vegetables**
  Well done! Fruit and vegetables contain more vitamin C than meat, fish and cereals.
- ○ **Cereals**
  Wrong! That's not the right answer.

Vitamin B12 can often be found in plant-based food.

- ○ **True**
  Wrong! Try again!
- ● **False**
  Well done! Vitamin B12 can be found in products of animal origin.

Which of these minerals are trace elements?

- ● **Iron and fluoride**
  Well done! Your body needs small amounts of these elements.
- ○ **Calcium and potassium**
  Wrong! These are macroelements.
- ○ **Herculaneum and petroleum**
  Wrong! These are not minerals.

ACTT02C02L01_A

Macronutrients and micronutrients

[11-13 years old and 14-16 years old]

Fill in the gaps.

Amino, oxygen, Oligo-elements, fatty, simple, vitamins, complex

Water is composed of [_____] and hydrogen atoms. Its chemical formula is H_2O.
Proteins are macronutrients made of chains of [_____] acids.
Fats are macronutrients made of chains of [_____] **acids**.
Glucose is a [_____] **carbohydrate**.
Starch is a [_____] carbohydrate.
Fruit and vegetables are mainly composed of [_____] and fibre.
[_____] are minerals present as traces in the body.

Answers

Macronutrients and micronutrients

[11-13 years old and 14-16 years old]

Fill in the gaps.

Amino, oxygen, Oligo-elements, fatty, simple, vitamins, complex

Water is composed of [**oxygen**] and hydrogen atoms. Its chemical formula is H_2O.
Proteins are macronutrients made of chains of [**amino**] acids.
Fats are macronutrients made of chains of [**fatty**] **acids**.
Glucose is a [**simple**] **carbohydrate**.
Starch is a [**complex**] carbohydrate.
Fruit and vegetables are mainly composed of [**vitamins**] and fibre.
[**Oligo-elements**] are minerals present as traces in the body.

ACTT02C02L01_D

Illustrating the presence of simple carbohydrates

[11-13 years old and 14-16 years old]

Instructions:

Show that apples contain sugars (simple carbohydrates):

- Cut up an apple into small pieces, about 5mm square.
- Put fifteen or so pieces into a test tube.
- Add some distilled water and several drops of Fehling's solution.
- Heat the tube for a few minutes over a Bunsen burner.

Be careful! Never point the top of the test tube at someone. Fehling's solution can cause severe burns. In case of contact with your eyes, rinse them carefully with plenty of water and see a doctor. Wear suitable protective clothing, gloves and eye protection. Should there be an accident or should you feel ill, consult your doctor immediately.

Result:

Initially the Fehling's solution is blue.

A brick-red precipitate forms if sugar is present.

ACTT02C02L01_E

Illustrating the presence of complex carbohydrates

[11-13 years old and 14-16 years old]

Instructions:

Proving that potatoes contain starch (complex carbohydrate):

- Cut a slice of potato.
- Put several drops of iodine water on the potato.

The result:

Iodine water is midnight blue when starch is present and yellow when there is no starch.

ACTT02C02L01_F

Illustrating the presence of proteins

[11-13 years old and 14-16 years old]

Instructions:

Illustrating that egg white contains protein:

- Cut up pieces of cooked egg white.
- Place them in a test tube.
- Add some distilled water, several drops of biuret reagent and several drops of NaOH 10%.
- Leave it to react for 15 minutes.

Be careful! NaOH causes severe burns and eye injuries. Wear suitable protective clothing, gloves and eye protection. Should it come into contact with your eyes, carefully rinse them with water for several minutes and immediately contact a hazardous products information centre or your doctor.

The result:

Proteins are made up of amino acids linked by peptide bonds.

The biuret reagent turns violet when more than 2 peptide bonds are present.

ACTT02C02L01_G

Illustrating the presence of fats

[11-13 years old and 14-16 years old]

Instructions:

Illustrating that walnuts contain fats:

- Cut a fine sliver of walnut.
- Place a drop of Sudan Red on the slice of walnut.
- Look at it under the microscope.

The result:

The Sudan colours the fat globules red.