Learning Lab

6 Natural Science

Natural Science 6 Learning Lab is a collective work, conceived, designed and created by the Primary Education department at Santillana, under the supervision of **Teresa Grence**.

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Do not write in this book.
Do all the activities in your notebook.

Richmond SANTILLANA

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How balanced is your diet? How do gastric juices dissolve food in the stomach? How much air can your lungs hold?	**Values education** Health in sport **Task** Blood transfusions
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Health tips Changes during puberty	**Values education** Reproduction and health **Task** Investigate twins
Does soap remove bacteria? Ways to fight infection Take care of yourself	**Values education** Accident prevention **Task** Emergency situations
Interpret changes of state What substance is needed during combustion?	**Values education** The availability of modern materials **Task** Separate a mixture
How can you create static electricity? Make a compass	**Values education** Saving electricity **Task** Make a conductivity tester

Be a scientist!

Scientists discover new things about the world around us every day. You can be a scientist, too. Here are some strategies to help you.

Be responsible. Look after your body. Do lots of exercise. Keep healthy.

Be observant. Study real examples. Look for details. Compare and classify things.

Be objective. Learn to organise your information. Analyse data and reach **conclusions**.

1 **What are the children doing in each photo? Why are they like scientists? Tell your partner.**

They are examining a stone.

They are like scientists because they are ...

Be creative. Try out your ideas. Use different skills and crafts. Use your imagination.

Be curious. Think about things. Ask yourself questions. Follow your ideas and investigate them.

Be open-minded. Explain your arguments. Always share information. Always listen to the opinions of other people.

2 **What other things do scientists do? Make a science corner.**

- Think about activities that require scientific strategies
- Print out or draw pictures.
- Make 3-D models. Write what you do to be a scientist.
- Set up a science corner with everyone's contribution.

1 Nutrition

What do you know about nutrients?

We need nutrients to stay alive. We obtain them by eating food. The main groups of nutrients are carbohydrates, fats, proteins, vitamins and minerals.

1 **Observe** Name as many of these foods as possible. Then, say the main nutrients in each one. Tell your partner.

Broccoli contains vitamins and minerals.

You already know!

- Carbohydrates and fats provide us with energy.
- Proteins are essential to build and repair our body.
- Vitamins and minerals help us to keep healthy.

What are the food groups?

We can classify foods into several different food groups according to the nutrients they contain.

2 Look at the photos and listen. Then, describe the food groups.

Bread, pasta and rice belong to the grains and cereals group.

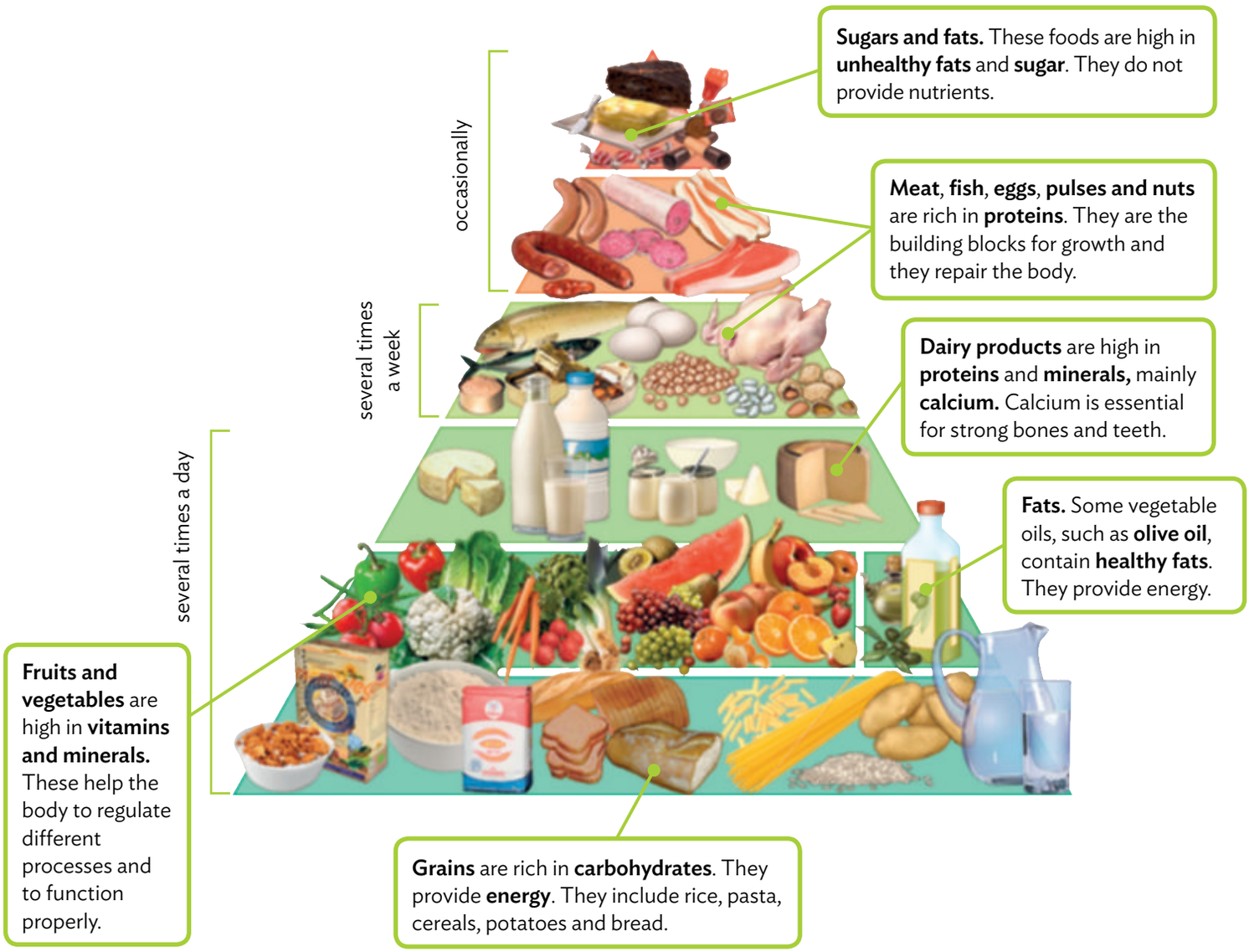
They provide energy.

Final task

Design a healthy lifestyle.

What are healthy food choices?

The **food pyramid** helps us to decide **which foods** to eat. It also tells us **how much of each food** we should eat to have a healthy and balanced diet.



1 ***Observe*** Look at the food pyramid. How often do you need to eat foods from each level? Explain

We need to eat grains several times a day to get enough energy.

2 ***Think about it*** Why is water included at the bottom of the pyramid?

Science facts

How much of our body is water?

About 60% of the human body consists of water.

Two thirds of this water is found inside our cells and between the cells. The rest is found in our blood plasma.

A healthy and balanced diet includes foods rich in **fibre**. Fibre is found in whole grains, and in many vegetables and fruits. Fibre helps the process of digestion.

Lifestyle

Water is the best drink

You should drink at least six glasses of water every day. You need even more water when you do exercise.

Mini Lab

How balanced is your diet?

Classify the foods you eat

1 Make a list of all the foods you eat in a typical day.

2 Then copy the table in your notebook.

	grains	fruit	vegetables	dairy	meat, etc.	fats	sweets	water
breakfast	✓	✓						✓
snack								✓
lunch								
snack								
dinner								

3 Put a tick in the corresponding column for each food on your list.

- Include drinks. For example, if you have orange juice and toast for breakfast, put a tick in the grains column and the fruit column.
- Include one tick for every glass of water you drink.

Analyse your results

4 Refer to your table and answer the questions.

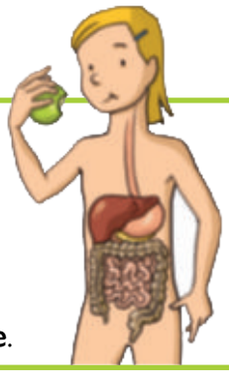
- From which food group do you eat the most often? And the least?
- Do you eat a large variety of foods?
- Do you eat the recommended amount from each food group?
- Do you drink enough water?

Write your conclusions

- On a typical day, my diet **is** / **isn't** healthy and balanced.
- I should eat more ... . I should eat less ... .

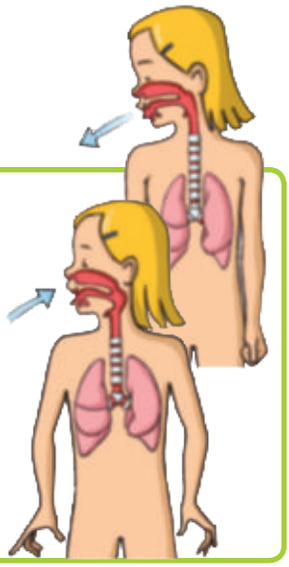
How do our body systems work?

During nutrition our body systems carry out **food processing**, **gas exchange**, **transporting materials** and **waste disposal**.



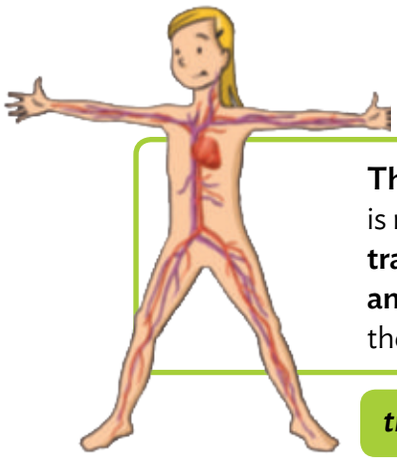
The digestive system is responsible for **digesting** the food we eat, and **obtaining nutrients** from the foods we eat. It **disposes of solid waste**.

food processing



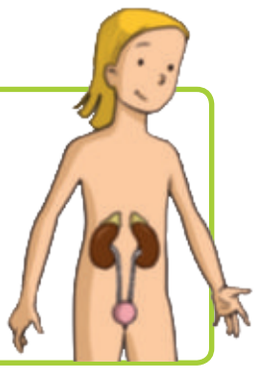
The respiratory system is responsible for **carrying out gas exchange.** This process involves taking in oxygen from the air and eliminating carbon dioxide from the body.

gas exchange



The circulatory system is responsible for **transporting nutrients and gases** throughout the body.

transporting materials



The excretory system is responsible for **disposing of liquid waste** from the body.

waste disposal

1 ***Classify*** **Look at the pictures. Copy and complete the table. Then, tell your partner.**

The digestive system is responsible for digesting...

body system	main organs	process
...	...	...
...	...	...

2 ***Think about it*** **Read the questions. Discuss with your partner.**

a. Which systems are involved in obtaining the substances we need?

b. Which systems remove waste from our body?

c. Why is it important to remove waste from our body?

How can we look after our body systems?

To keep our body healthy and look after our body systems we need to practise **healthy eating habits**, **good hygiene habits** and **healthy routines**.

A healthy digestive system

- Try to eat all the types of nutrients in each meal.
- Eat the recommended amount of foods from each food group.
- Eat foods rich in fibre.
- Wash fruits and vegetables before you eat them.
- Chew your food many times.
- Wash your hands before and after each meal.
- Brush your teeth three times a day.

A healthy respiratory system

- Avoid cigarette smoke.
- Spend time in areas with clean air, such as natural parks and forests.
- Air your room every day and keep it clean and dust-free.

A healthy circulatory system

- Eat foods rich in healthy fats such as salmon, olives, avocados, nuts and olive oil.
- Do exercise or play sports every day.
- Walk and ride your bicycle instead of travelling by car.

A healthy excretory system

- Drink at least six glasses of water a day.
- Go to the toilet as soon as you feel the need.
- Take a shower and use soap every day.

3 **Listen to the nutritionist. Then, make a recommendation. Your partner says which system it benefits.**

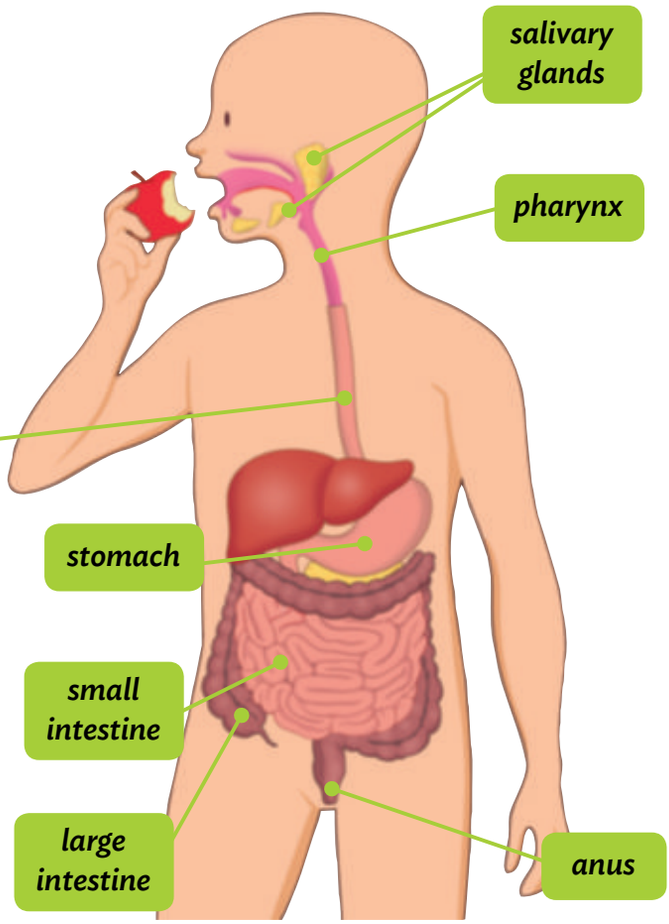
You should air your room every day.

It benefits the respiratory system.

How does the digestive system work?

Food processing takes place in the **digestive system**. Digestion consists of four stages: **ingestion**, **digestion**, **absorption** and **elimination**.

Ingestion begins in the **mouth.** The **teeth** break down food. The pieces mix with **saliva** from the **salivary glands.** This mixture is called a **bolus.** When we swallow, the bolus is pushed into the **pharynx** and down the **oesophagus** to the **stomach**.



Absorption takes place in the **small intestine**. Tiny hairs called **villi** on the walls of the small intestine help absorb nutrients into the **blood**.

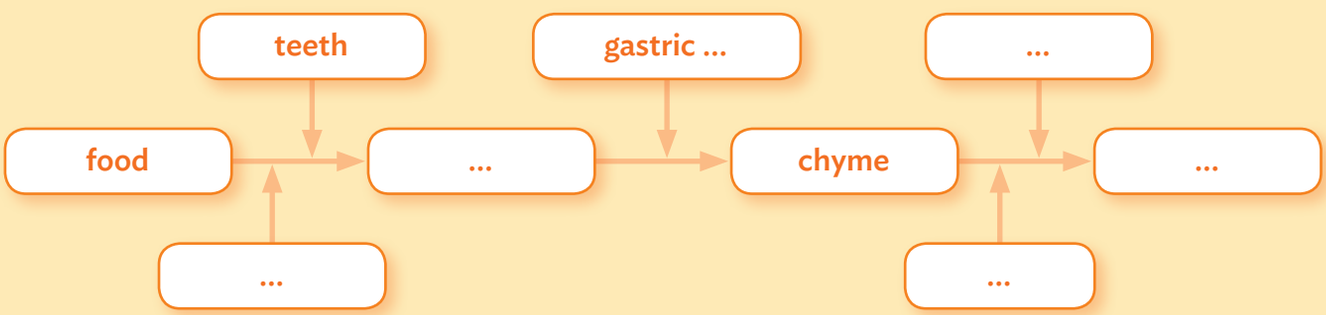
Digestion begins in the **stomach**. Here, **gastric juices** dissolve the bolus into a thick liquid called **chyme**. The chyme passes into the **small intestine**.

Intestinal juices, and other juices, turn the chyme into a milky liquid called **chyle**.

Elimination takes place in the **large intestine**. The mixture left after the nutrients have been absorbed turns into solid waste, called **faeces**. Faeces leave the body through the **anus**.

1 ***Observe*** **Imagine you are eating an apple. Describe the stages of digestion to your partner.**

2 **Listen, then complete the flow diagram about ingestion and digestion.**



Mini Lab

How do gastric juices dissolve food in the stomach?

You need

- 5 glasses
- 500 ml white vinegar
- small portions of brown bread, cooked meat, an apple, cooked rice and a sweet

Do your experiment

1 **Predict.** First, predict how long it will take for each food to dissolve in gastric juices. Write your predictions in the table.

2 Fill each glass with 100 ml white vinegar. The vinegar represents the gastric juices.

3 Put each portion of food in a different glass.

4 Observe the glasses after one, then two days. Copy and record in the table how long it takes for the food portions to dissolve.

Analyse your results

- Which food dissolved the fastest?
- Which food dissolved the slowest?
- Why do you think some foods dissolve faster than others?

food	prediction time (days) for portions to dissolve	real time for portions to dissolve
brown bread	...	...
cooked meat	...	...
apple	...	...
cooked rice	...	...
a sweet	...	...

3 ***Think about it*** **What do we use kitchen items for? Match them and write the corresponding organ and a stage of the digestive system.**

A 

B 

C 

D 

The respiratory system

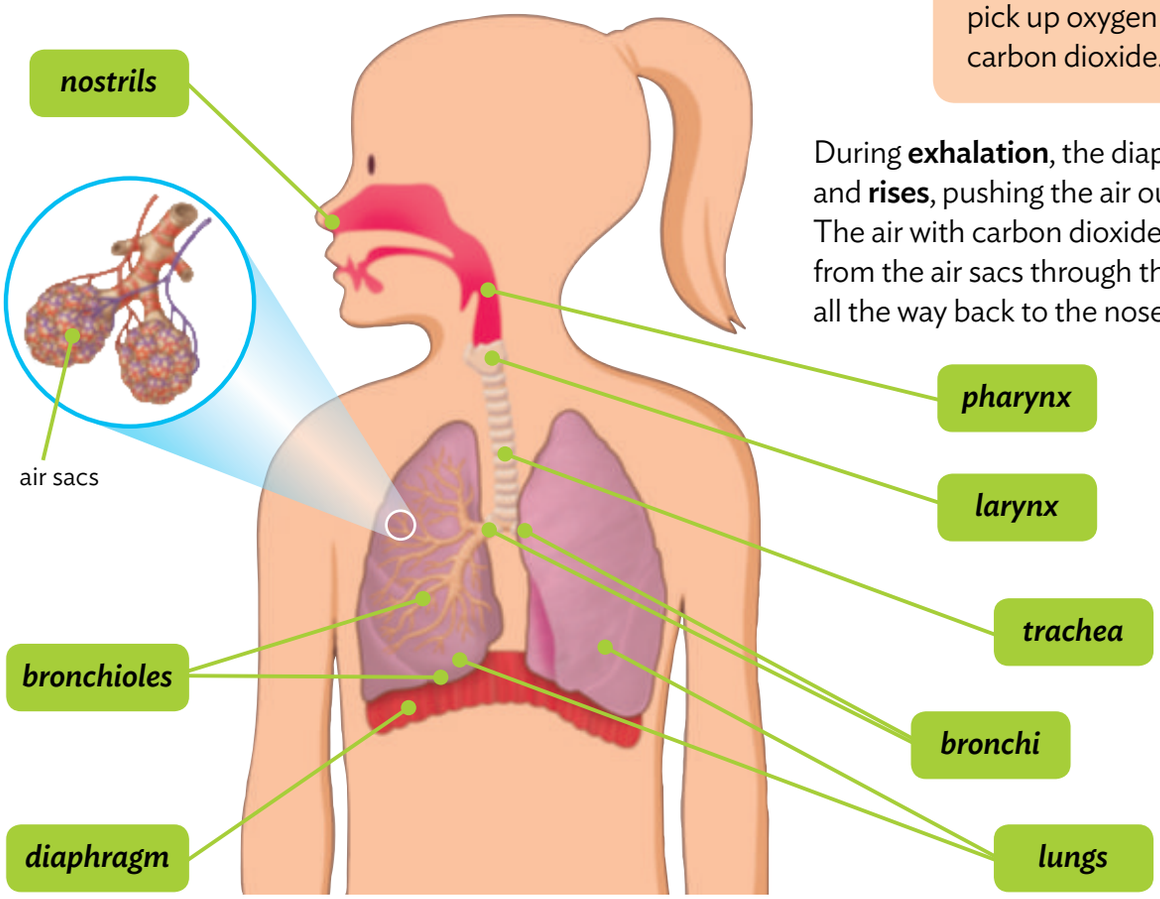
Respiration takes place in the **respiratory system**. It involves two stages: **inhalation** (breathing in) and **exhalation** (breathing out).

During **inhalation**, the diaphragm **contracts** and **descends**, creating space for the lungs to expand. This movement draws air with oxygen into your **nostrils** and **mouth**. Then, the air continues to the **pharynx**, and down the **larynx** and the **trachea** to the **lungs**. At the lungs, the air enters the **bronchi**, then the **bronchioles** and finally it reaches the **air sacs**.

Science facts

Do we need to tell our body to breathe?

No! Breathing happens automatically about 15 times per minute. That is over 20,000 times a day! When we do exercise, our breath rate increases. This is because our heart pumps more blood to pick up oxygen and eliminate carbon dioxide.



During **exhalation**, the diaphragm **relaxes** and **rises**, pushing the air out of the lungs. The air with carbon dioxide leaves the body from the air sacs through the air passageways all the way back to the nose and mouth.

1 **Observe** Look at the diagram. Take turns to tell your partner what happens when you breathe in and out.

2 **Think about it** Which part of the body is common to both the respiratory and the digestive system?

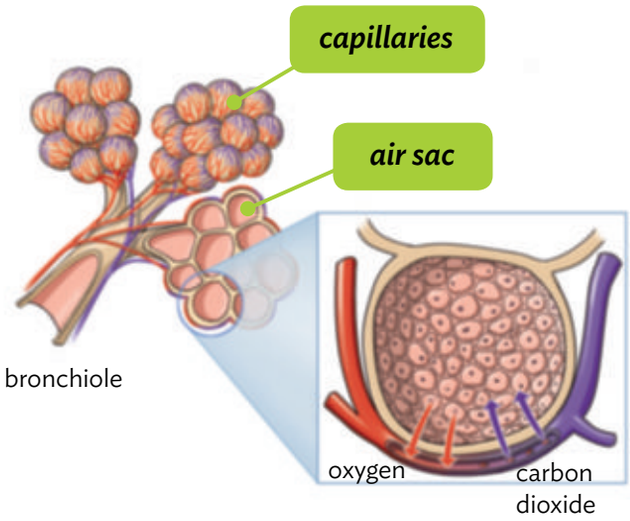
When we breathe in, the diaphragm contracts and descends.

I think...

How does gas exchange work?

Gas exchange takes place at the air sacs. Air sacs are surrounded by **capillaries**.

- The **oxygen** in the air we inhale passes from the air sacs into the blood inside the capillaries. The oxygen is then transported in the blood to all the cells in the body.
- Our **body cells** produce **carbon dioxide**. This **waste gas** is transported in the blood to the air sacs. The air sacs expel carbon dioxide when we exhale.



Mini Lab

How much air can your lungs hold?

You need

- 2 balloons
- a tape measure

Do your experiment

1 Stretch and pull the balloon before you blow it up.

2 Take a deep breath, then exhale all the air into your balloon.

3 When your balloon is a sphere, close the end.

4 Hold the balloon, while your partner measures the circumference.

5 Repeat the experiment twice more for each of you.

6 Record your results in a table like this:

	name:	name:
	circumference in cm	
experiment 1	...	...
experiment 2	...	...
experiment 3	...	...

Analyse your results

7 Was the circumference of your balloons always the same each time?

8 Compare your measurements to your partner's.

Write your conclusion

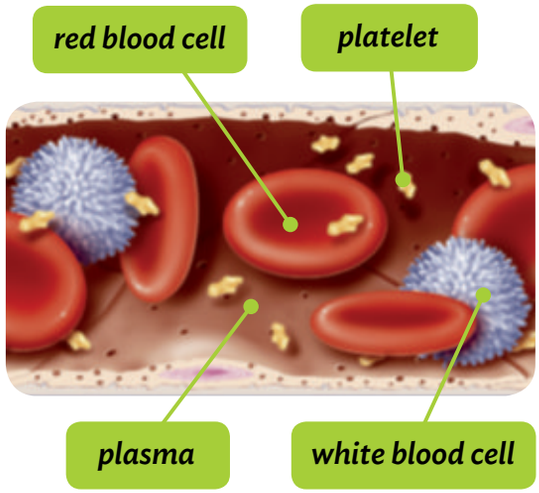
- Do we all have the same lung capacity? Write a few sentences in your notebook.

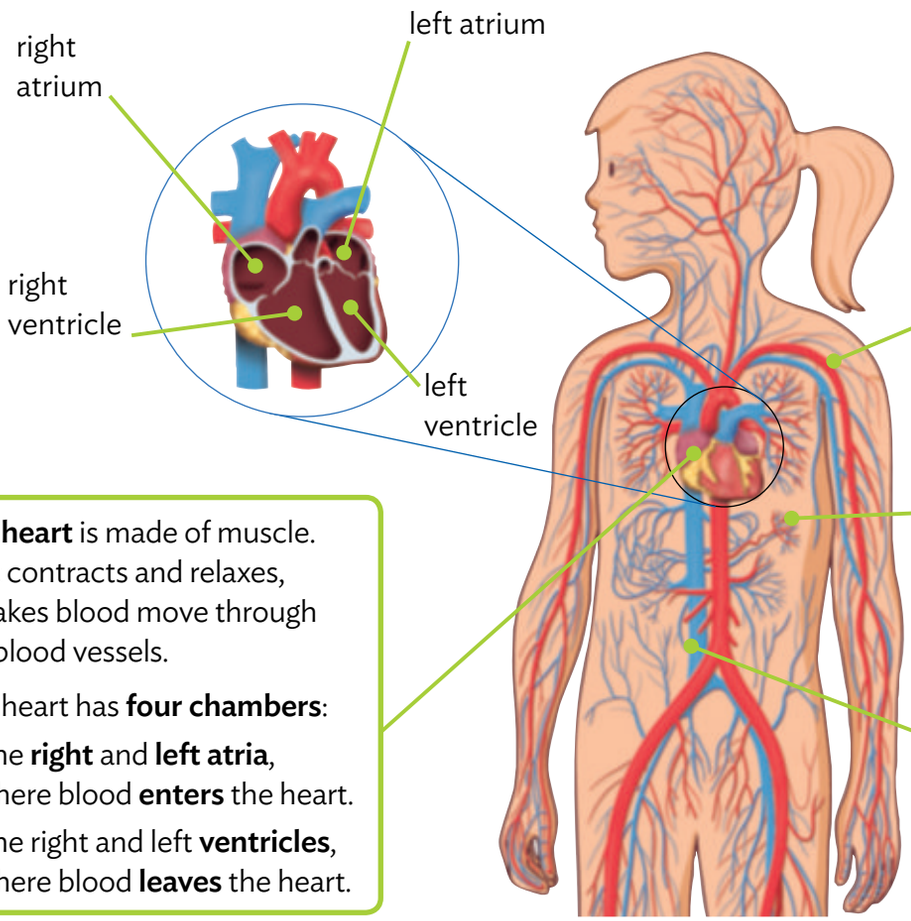
The circulatory system

Blood is pumped by the heart through the **blood vessels** around the body. **Nutrients**, **gases** and **waste products** are transported in the blood through the **circulatory system**.

We have about five litres of blood in our body. Blood consists of different types of cells in a clear liquid called **plasma**. Each type of blood cell has a different function.

- **Red blood cells** carry oxygen from the lungs to all the body cells.
- **White blood cells** protect us from germs.
- **Platelets** are fragments of old cells. They help to stop bleeding from wounds.
- **Plasma** transports nutrients and waste products around the body.





The **heart** is made of muscle. As it contracts and relaxes, it makes blood move through the blood vessels.

The heart has **four chambers**:

- The **right** and **left atria**, where blood **enters** the heart.
- The right and left **ventricles**, where blood **leaves** the heart.

Arteries are blood vessels that carry blood **away from the heart** towards all body tissues.

Capillaries are blood vessels with very thin walls. These walls allows **nutrients** and **oxygen** to pass into the body cells, and for **carbon dioxide** and other **waste product**s to leave the cells.

Veins are **blood vessels** that carry **blood back to the heart** from all body tissues.

1 ***Observe*** **Look at the diagram of the heart. Identify the arteries and veins. Explain how the blood moves in and out.**

2 ***Compare*** **How are arteries, veins and capillaries similar? How are they different? Write, then listen and check.**

The excretory system

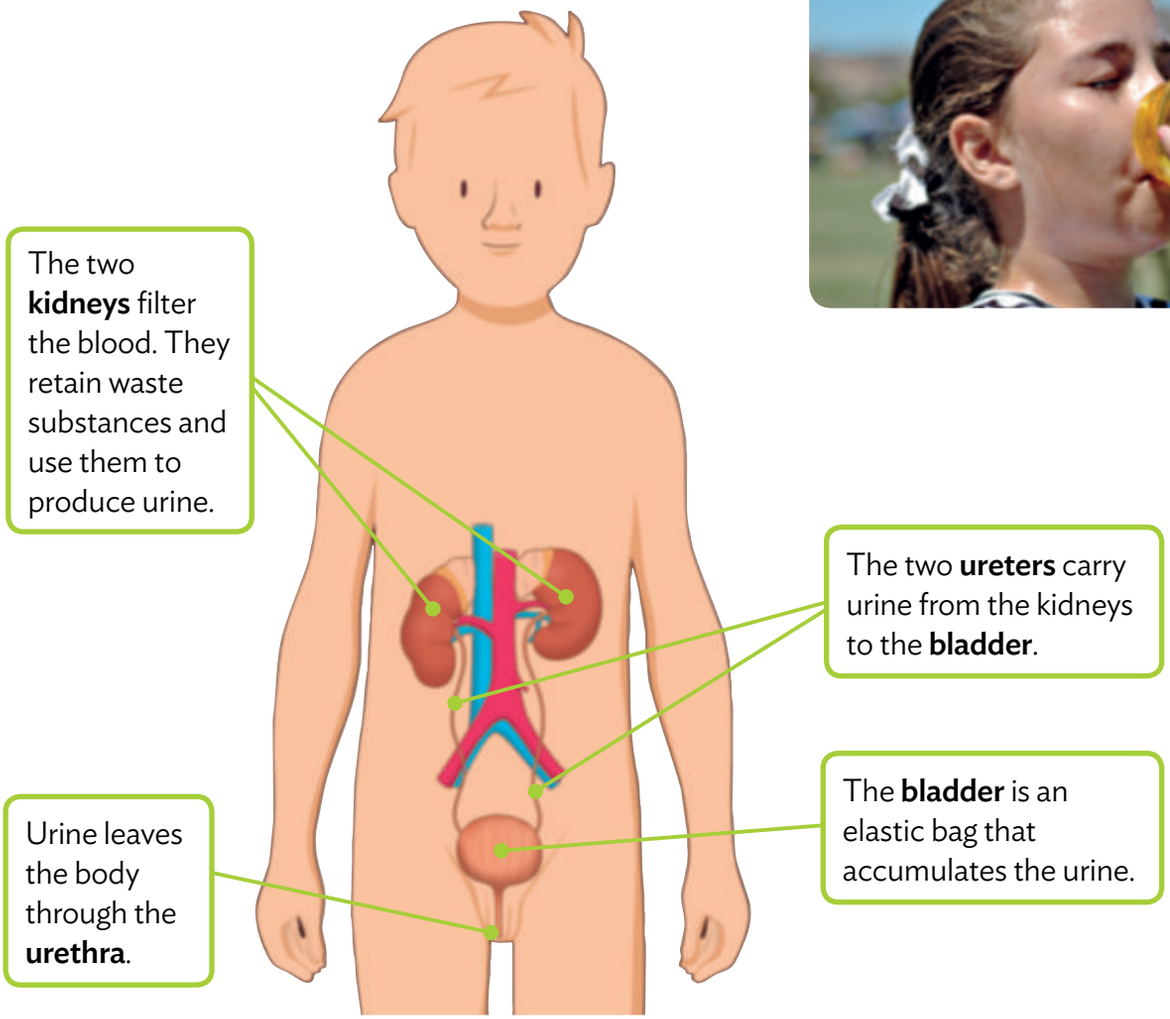
Our body produces three types of waste: **liquid**, **solid** and **gas waste**.

Liquid waste, known as **urine**, is eliminated through the excretory system. This system is responsible for eliminating waste substances from the blood. In this way, clean blood always circulates around the body.

Science facts

Why do we sweat?

When we sweat, we eliminate liquid waste through our skin. Sweat is mainly water, but contains waste substances as well. When we exercise, sweating increases to help to keep our body cool.



3 Look at the diagram. Which organ produces the urine? Which organ stores it? Why is it important to have an organ that stores urine?

4 Copy the diagram and label the excretory system.

5 ***Think about it*** Why do you think doctors take urine samples to test if a person is healthy?

Check your progress

Vocabulary

1 **Write two examples of foods that are rich in these nutrients in your notebook. Include two other foods that are rich in fibre.**

- carbohydrates
- proteins
- fats
- vitamins and minerals

2 **Listen and say *digestive system*, *respiratory system*, *circulatory system* or *excretory system*.**

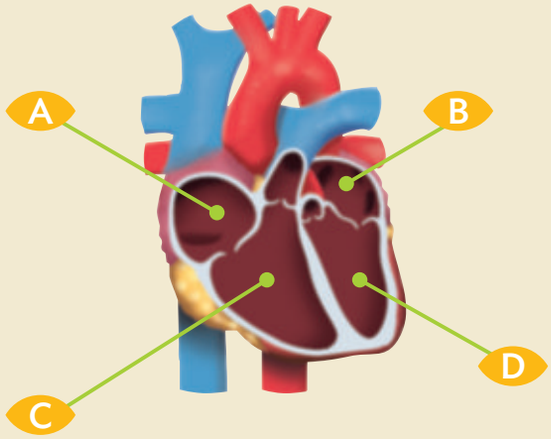
Concepts

3 **Write the organ of the digestive system where each of the following stages takes place.**

- ingestion of food
- digestion of food
- absorption of nutrients
- elimination of solid waste

4 **Look at the diagram. What system is it? Copy it and label the parts.**

5 **Copy the diagram of the heart and label its parts. Then, use arrows of different colours to show where blood enters and leaves the heart.**



6 **Complete the sentences about the excretory system and write them in order.**

a. The ... transport urine from the kidneys to the bladder.

b. The ... produce urine and return nutrients and water to the blood.

c. Urine leaves the body through the ....

d. The ... stores urine until it leaves the body.

Apply what you know

7 **When we do exercise our heart beats faster. Explain why in your notebook.**

8 **Why is drinking water important for our digestive and excretory systems?**

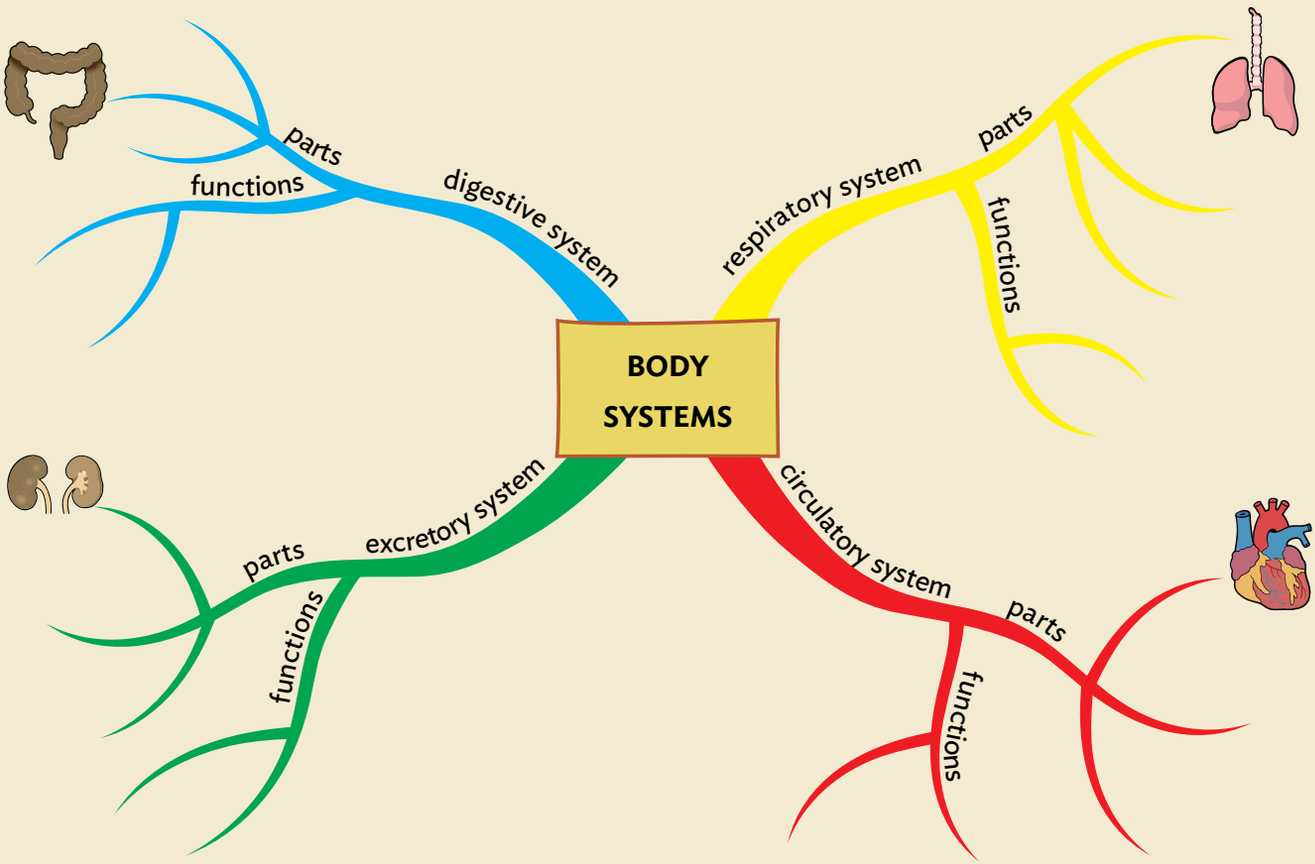
9 **Use these words to describe two functions of the small intestine.**

- chyme
- chyle
- villi
- nutrients

Apply what you know

10 **Which parts of the digestive, the respiratory and the excretory systems interact with the blood in the circulatory system?**
Explain in your notebook.

11 **Copy and complete the graphic organiser. Write three parts and two functions for each system.**



My progress **Think about your work in this unit. Copy and complete.**

	YES	NO	NOT SURE
• I can make healthy food choices.	...	...	...
• I can identify the parts of the body systems.	...	...	...
• I can describe the functions of the body systems.	...	...	...

Final task

Design a healthy lifestyle

In order to stay healthy, we need to have a balanced diet, be physically active and make healthy lifestyle choices.

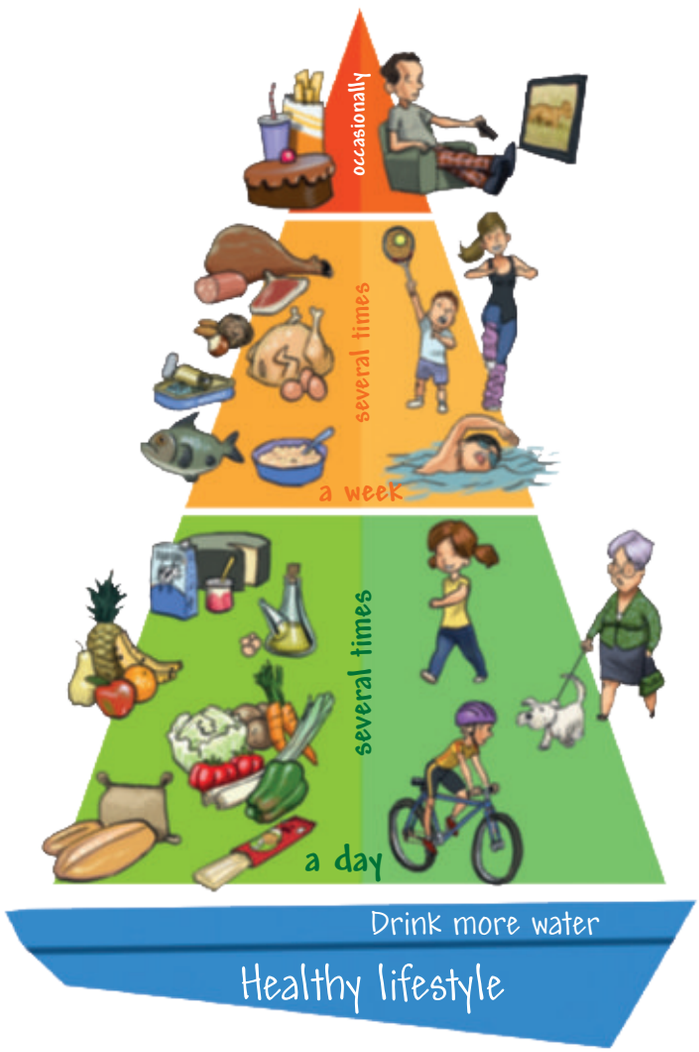
Learn about the NAOS pyramid

The NAOS pyramid is used to recommend foods and physical activities in line with the Mediterranean diet.

- This pyramid divides the food groups into three levels of consumption.
- It divides different physical activities into three levels of frequency.

1 **Study the pyramid. Then, complete a table with some recommendations for a healthy lifestyle.**

frequency	foods and drinks	physical activity
several times a day	***drink water***	***go for a walk***
several times a week	...	...
occasionally	...	...



2 **Look at the pyramid again. Tell your partner recommendations for a healthy lifestyle.**

Drink water ***several times a day.***

Go for a walk ***three times a week.***

3 **Do you agree with all the recommendations of the NAOS pyramid?**

Be a scientist!

Make a brochure about a healthy lifestyle

You need

- a sheet of A4 paper
- coloured marker pens
- scissors
- glue
- magazines

Prepare your brochure

1 **Study these recommendations for a healthy lifestyle.**

Ways to lead a healthy lifestyle			
	Brush your teeth regularly and visit the dentist.		Sleep at least 10 hours each night. Lack of sleep can affect your growth and your immune system.
	Use sunscreen all year round when outdoors whether it is sunny or cloudy.		Use a helmet for protection when riding a bike or a skateboard, and when skating or skiing.

Make your brochure

2 **Follow these instructions.**

- Fold the sheet of paper in half and write a title on the front page.
- On the next two pages, draw your own NAOS pyramid. Draw healthy foods and physical activities you enjoy.
- On the fourth page, make a healthy lifestyle table like the model.

3 **Present your brochure to the class and share your ideas.**

Learning Lab game

4 *Which body system disposes of liquid waste?*

3 *Fruits and vegetables are high in...*

2 *Grains are rich in... They give us...*

5 **Come up for air. Miss a turn!**

6 Where does gas exchange take place?

7 *The four stages of digestion are: ingestion, ..., absorption and...*

8 Where does the oxygen we breathe in go in the body?

9 What do red blood cells do?

1 **Make a coin. Write 1 and 2.**
1 = one move
2 = two moves

2 **Flip the coin. Move your counter.**


Finish
18
Describe what an involuntary movement is.
17
Give two examples of voluntary movements.
16
The axom and dentrites are parts of what cell?
1
Name four foods that contain protein.
Start
15
Which system do the brain and spinal cord belong to?
14
What two systems make up the nervous system?
13
What is stored in the bladder?
11
What do the kidneys do?
12
Strong current. Go to 14!
10
What two systems make up the locomotor system?

SCIENCE MAGAZINE

Purple super foods

Super foods are foods that contain essential nutrients such as vitamins, minerals, fibre and proteins. Your body needs these nutrients to keep healthy.

Many nutritionists believe that purple foods are the top super foods. Purple foods get their colour from plant pigments called anthocyanins. Anthocyanins give fruits and vegetables their purple, bright red, or blue colour.

Blueberries contain a lot of vitamin C, which protects cells. They also contain fibre which is good for your digestive system. Blueberries can help your memory, and make your brain work more efficiently.

Pomegranate, another super food, also contains a lot of fibre, and provides you with vitamins A, C and E, as well as minerals like iron.

Many athletes eat beetroot because they say it contains vitamins and minerals that help them to perform better. Red cabbage contains fibre, vitamin A for healthy vision, vitamin K for strong bones, and vitamin C to protect you against disease.

Not all foods are not purple. For example, garlic helps to protect your body from bacteria, and dark chocolate has lots of essential minerals like iron and magnesium. ■

1 **Read the text and answer the questions.**

a. Why is it important to eat super foods?

b. Why are some super foods purple?

c. How can blueberries help you study better?

d. How many different vitamins does a pomegranate contain?

e. What super food is beneficial for athletes?

f. Which super food helps you to see better?

2 **Are there any purple superfoods in your kitchen? Make a list of some super foods you would like to try.**

Read about it!

SCIENCE MAGAZINE

What is graphene?

Graphene is a very thin transparent layer of carbon atoms arranged together in hexagon shapes. It is made from graphite, which is used to make pencil leads. For many professionals, graphene is the most important new material in the world. It is the lightest, thinnest and strongest material that exists today. It is two hundred times stronger than steel. It has a diameter million times thinner than a human hair.

Graphene is a very good conductor of electricity and heat. It is also very flexible and elastic so we can change its shape easily. This means that it can be used for many different things such as batteries or flat screen televisions.

Many tennis rackets are coated with graphene to make then lighter and stronger. The transparent screens of mobile phones are made of graphene. Graphene is also used in very small computer chips.

There are plans to use graphene to create batteries for mobile phones. These batteries would last longer and charge much faster. Scientists say there are many more possibilities for this new wonder material. ■

1 **Read the text and decide if the sentences are true or false.**

a. Graphene is made from the same material as pencils.

b. It is not as heavy as other materials.

c. Steel is not as strong as graphene.

d. Graphene does not change shape.

e. It is used on TV and mobile phone screens.

f. There are plans to use it for new mobile phone components.

2 **Search the internet to find out how graphene was discovered.**

Key vocabulary

1 Nutrition

balanced diet consumption of the right amounts and types of food.

bladder an elastic bag that accumulates urine in the body.

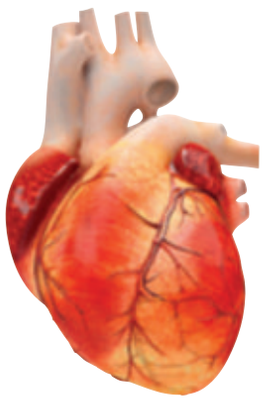
bolus a mixture of food and saliva in the mouth after food is ingested.

calcium a mineral found in dairy products that is essential for strong bones and teeth.

chime a thick liquid in the stomach after gastric juices dissolve the bolus.

chyle a milky liquid in the small intestine after intestinal juices dissolve the chime.

circulatory system the body system responsible for transporting nutrients and gases through the body.



digestion the process by which food is broken up and absorbed in the body.

digestive system the body system responsible for digesting food, obtaining nutrients from food, and eliminating solid waste from the body.

excretory system the body system responsible for expelling liquid waste from the body.

faeces the solid waste that is produced when nutrients are absorbed in the body.

fibre a substance found in whole grains and many vegetables and fruits that helps the process of digestion.

food pyramid a diagram in the shape of a pyramid that provides advice on healthy food consumption.

gas exchange the process of taking in oxygen from the air and eliminating carbon dioxide from the body.

ingestion the process of taking food into the body.

nutritionist a person whose job is to give advice on healthy eating.

plasma the clear liquid in which the blood cells are found.

saliva a liquid that enters the mouth from the salivary glands and helps us to chew and swallow food.

urethra the tube beginning in the bladder through which urine leaves the body.

urine liquid waste that is expelled from the body through the excretory system.

ventricle one of the two main chambers in the heart.

villi tiny hairs on the walls of the small intestine that help to absorb nutrients into the blood.

Matter

alloy a homogeneous mixture in which one or more components are metals.

atom a tiny particle that forms the basic unit of matter.

chemical reaction a chemical change when two or more substances combine to form a new substance.

combustion the chemical reaction when objects are burned, producing light, heat, smoke and ashes.

contraction the decrease in volume when solids cool.

decantation the process of separating substances in a heterogeneous mixture when they do not have the same density. Oil and water can be separated through decantation.

desalination the process of removing salt from sea water.

distillation the process of separating liquids through selective evaporation and condensation.

electrical energy the energy produced by the movement of charged particles.

evaporation the process of separating a liquid from a solid by making the liquid evaporate. Salt is extracted from sea water through evaporation.

fermentation the chemical reaction that occurs in some living things, like yeast and bacteria. Fermentation is used to produce yogurt and bread.

filtration the process of separating a liquid from a solid by using a filter through which only the liquid can pass.

heterogeneous mixture a mixture in which the different components can be distinguished.

homogeneous mixture a mixture in which the different components cannot be distinguished.

kinetic energy the energy of an object due to movement.

light energy the energy from a light source, such as the Sun or a light bulb.

mechanical energy the energy of an object due to its movement and position.

nuclear energy the energy stored in nuclear fuels, like uranium and plutonium. This releases huge amounts of energy when their atoms are split.

oxidation the chemical reaction when metal substances, like iron, combine with oxygen and water to produce rust.

potential energy the energy of an object due to its position.

rust the red or brown covering on iron caused by oxidation.

sublimation the process by which a solid turns into a gas.

vaporisation the process by which a liquid turns into a gas through evaporation or boiling.