

Our senses and nervous system

1. Our senses

- The five main senses are: **touch, sight, hearing, taste** and **smell**. These senses allow us to interpret what is happening around us.
- We are aware of what happens around us because our **sensory receptors** respond to **stimuli**. This information is then processed by our **nervous system**.
- Our sensory receptors are specialised cells which detect any stimuli around us. Together they form the **sensory organs**, such as our eyes or ears.
- We use our sense of touch to interpret information about objects such as **texture, temperature (hot or cold), pain or pressure**.

2. The parts of the eye

- The eye is made up of three layers: the **sclera**, the **choroid** and the **retina**. Other parts of the eye are: the cornea, lens, pupil, iris, vitreous humour and optic nerve.
- Our **eyes** are very delicate organs, so we have various features which help protect them:
 - **eyebrows** stop sweat from going into our eyes.
 - **eyelids** and **eyelashes** protect our eyes from the air, excess light and foreign bodies.
 - **lachrymal glands** produce tears that keep the surface of the eye moist.
- **Sight** is when our eyes receive images and our brains interpret them. Light is essential in this process.
- To be able to see an image, such as a tree in a landscape, light has to enter the eye through the cornea. It then crosses the pupil and the lens, and it reaches the retina, the part of the eye that is sensitive to light.
- The image we are looking at is then projected onto the retina and transformed into a nerve signal. This signal reaches the brain for interpretation through the optic nerve.

3. Hearing

- We hear the **sounds** around us thanks to our sense of **hearing**.
- We detect and interpret the sounds around us thanks to our sense of hearing. The sensory organs we use for hearing are our **ears**.
- Our ears are divided into three parts:
 - The **outer ear**. This consists of the ear (**pinna**) and the **external ear canal**.
 - The **middle ear**. This is a small **cavity** which conducts sound. It starts with the eardrum and contains a chain of three tiny bones: the **hammer**, **anvil** and **stirrup**. This cavity conducts sound to the inner ear through the **oval window**.
 - The **inner ear**. This contains the **cochlea**, which converts sound into nerve impulses.
- **Hearing** occurs when our ears detect and process **sound**.
- Sound travels in the form of **sound waves** that pass through the air. These waves enter the ear, travel along the external ear canal and arrive at the eardrum. When the eardrum receives these waves, it vibrates and passes the vibrations to the tiny bones in the inner ear. These bones then pass the vibrations to the oval window. As the oval window oscillates, the liquid in the cochlea moves. This then makes the auditory receptors move, sending the stimuli to the brain through the auditory nerve.
- **Sound intensity** indicates how **strong** or **weak** a sound is. It is measured in **decibels** (dB). Sounds of 10 dB are so weak that they are difficult to hear. Sounds of over 120 dB are so strong that they can damage our ears.

4. Taste and smell

- The tongue is responsible for our sense of **taste**. The taste receptors in our tongues detect flavours in food. These receptors are little bumps on the surface of our tongues that group together to form **taste buds**.
- There are four main types of taste receptors on the tongue. They detect different basic flavours: **bitter**, like coffee; **sour**, like lemon; **sweet**, like sugar; and **salty**, like salt. A fifth basic flavour, **umami**, has recently been discovered.
- The **nose**, which we use to interpret smells, is responsible for our sense of smell. The olfactory receptors at the top of the nasal cavity are located in the **olfactory epithelium**.
- Our sense of taste and smell work together. When we eat, we can taste and smell food at the same time. This helps us enjoy the flavours more intensely.

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5. How to look after our sensory organs

- Looking after our skin:
 - Take a shower every day to keep your skin clean.
 - Wash your hands often, especially before and after eating. Keep your fingernails short and clean.
 - Be careful in the Sun: do not spend too long in the Sun and apply a high factor suncream (at least factor 30).
- Looking after our eyes:
 - Do not touch your eyes, and never touch them when your hands are dirty.
 - Do not look directly at the Sun or at intense light.
 - When you are watching television, sit at least three metres away from the screen.
 - When you are reading or writing, make sure there is enough light.
 - If you wear glasses, make sure you always wear them. In summer, wear sunglasses.
 - Visit the optician once a year.
- Looking after our ears:
 - Clean your ears when you have a shower and dry them well afterwards.
 - Do not put sharp objects into your ears.
 - Do not listen to music at a high volume, especially when using headphones.
 - If you have any problems with your ears, visit the doctor.
- Looking after our tongue:
 - Keep your teeth, gums and tongue clean by brushing your teeth after every meal.
 - Avoid eating or drinking very hot foods or drinks that can burn your tongue.
 - Avoid foods that are extremely spicy, salty, sour or sweet.
- Looking after our nose:
 - Avoid spending too much time close to very strong smells. Some are toxic.
 - Blow your nose gently to avoid irritating the nostrils and use a clean tissue.
 - Do not put objects or your fingers up your nose.

6. The nervous system

- The **nervous system** transmits signals to different parts of our bodies to coordinate our voluntary and involuntary actions.
- These actions respond to the stimuli around us, such as the phone ringing or a person knocking on the door, and to stimuli from inside our bodies, like feeling hungry or thirsty.
- The nervous system has two main parts: the **central nervous system** and the **nerves**.
- The central nervous system consists of four nerve centres, which are connected to each other: **the brain, cerebellum, brain stem and spinal cord**.
- The nervous system consists of specialised cells called **neurons**.
- These cells have many short fibres called **dendrites** and one long fibre at the end called the axon. The **axon** is shaped like a branch.

7. How we move our bodies

- The nervous system is responsible for two types of actions: **voluntary** and **involuntary actions**.
- Involuntary actions are those that our bodies perform but which we have no control over. For example, our mouths water when we see a food that we like.
- Some involuntary actions are very simple and consist of an immediate reaction to a stimulus. These reactions are called reflex actions.
- **Voluntary actions** are those that we choose to do. When we run, read or sit down, we are performing voluntary actions.

8. Our skin's sensitivity

- The **skin** is the organ that connects our bodies to our environment. Because of our skin, we know whether an object is hot, if something is hurting us or if something is touching us.
- The epidermis is:
 - the external layer of skin.
 - the thinnest layer of skin (between 0.07 and 1.4 millimetres thick).
 - water-resistant and a protective barrier.
 - constantly renewing itself.
- Next, is the dermis. This is:
 - a wavy layer of skin with a layer of loose tissue underneath it.
 - where we can find the cells that give skin its colour.
- After that is the hypodermis. This is:
 - the deepest layer of the skin.
 - where we can find the adipose cells.
 - a thermal insulator and shock absorber.
