

Lesson 18: The Senses

Lesson Objectives:

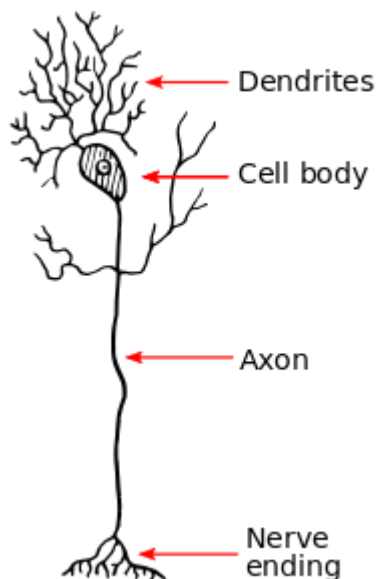
Students will explore the senses of smell, hearing, sight, taste and touch.

Student will learn the structures and functions of the eye.

Student will learn the structures and functions of the outer, middle and inner ear.

Student will learn the structures and functions of the olfactory lobes.

In this lesson we will review the body's five senses: smell, hearing, sight, taste and touch. Our senses play an important role in the healthy functioning of our body.



The dendrites of our sensory neurons are specially designed to receive specific impulses and transmit the message to the brain. The brain will interpret the impulses and send them back to the body for a response. For example, **thermoreceptors** are sensory neurons that are capable of detecting a change in temperature. **Chemoreceptors** respond to chemical changes; **pain receptors** respond to pain, and **photoreceptors** respond to changes in light.

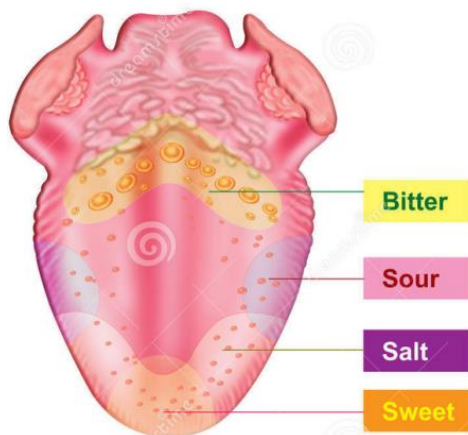
Our ability to respond to changes in our environment can be life-saving. We smell a fire before we see the flames and can react quickly to get out of danger. If we put our hand on a hot stove, our pain receptors tell us to react by pulling our hand away.



Taste

We learned about the taste receptors (located in the taste buds) in the digestive system lessons. These specialized sensory neurons can differentiate between sweet, sour, salty, and bitter. Did you know that interpreting the flavor of food requires several senses including taste, smell, touch (food texture) and pain (think about hot peppers) and sight to work together?

TASTE AREAS ON TONGUE



Smell

Special chemoreceptors in the nose detect odors in the air. Substances with volatile chemicals, molecules that evaporate easily, float through the air and are picked up by these special neurons. Onions, flowers, fruit, cheese, and baking bread all have volatile chemicals. A piece of steel has no odor because it has no volatile chemicals.

Humans have about five million chemoreceptor neurons located in the inside the nasal cavity. As amazing as that sounds, dogs have over 200 million chemoreceptors, and a bloodhound has 300 million!

Click on the image to watch this five minute video about the amazing sense of smell in the bloodhound.

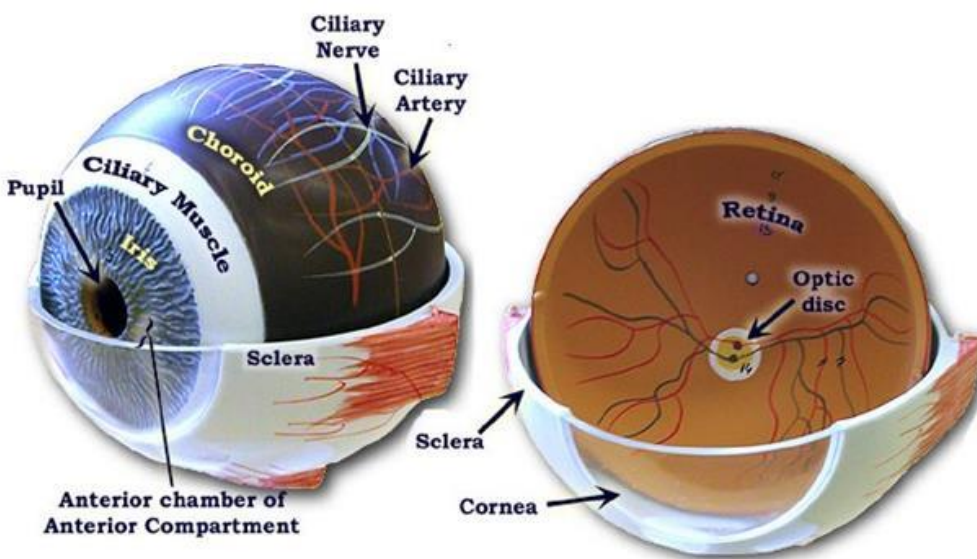




Your sense of smell can trigger memories and can even affect your mood by sending impulses to the amygdala, a part of the cerebral cortex that processes emotion. When you smell something new, you link it with an event, a person, or place. When you smell this again, your brain associates the odor with your past experience. For many people, the smell of freshly cut grass brings memories of summer. Can you think of a smell that triggers a memory or emotion?

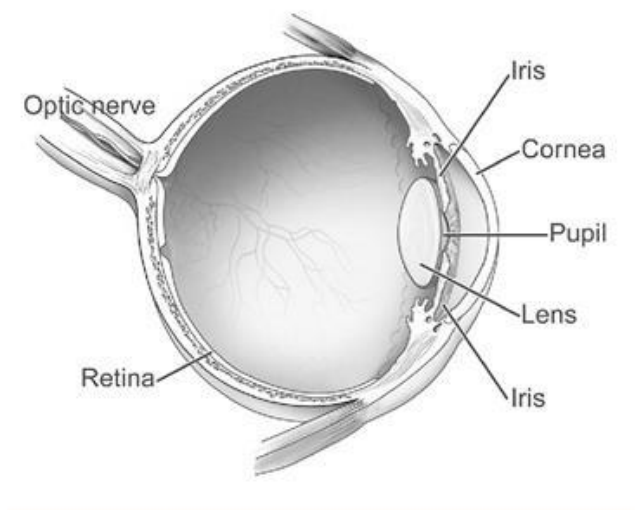
Sight

Our eyes are one of our smallest organs; however they are very complex and give us the most amazing sense of sight. The human eye is approximately a 1" round sphere. It is filled with a gel-like fluid that maintains its shape.



The outside covering is the **sclera**. This protects the eyes and serves as the insertion for six muscles that move the eyes. The front of the eye is the clear **cornea**. This clear membrane allows light to enter the eye through the **iris**, the colored part of our eye. If you wear contact lenses, you are placing the contact over the cornea. The iris can constrict and dilate; causing the **pupil** to become larger and smaller. This controls the amount of light entering the eye. On a bright sunny day, your pupil will be small, closing out the light. In a darkened room, your pupil will be large to allow the most light to enter the eye. The **lens** is clear and football shaped. Muscles attached to the lens change the shape and direct the light to the **retina** where the photoreceptors are. The lens changes shape when we look at and focus on something in the distance and then look at and focus on something close up.

People who can focus close up, but not on distant objects are nearsighted. People who can focus on distant objects but not close up are farsighted. Many people wear corrective lenses so that they can focus on objects at any distance. As we age, the lens becomes less elastic and it becomes more difficult to focus on close objects. This is why you see so many older people wear reading glasses as they get older.



In the back of the eye is the **retina** with specialized sensory nerves called **rods**, which allow us to see in low light, and **cones**, which allow us to see color. In the center of the retina is the **macula**. It contains only cones and is where the lens focuses light to see fine detail.

The optic nerve leaves the back of the eye and sends impulses to the brain. The area of the retina where the optic nerve is located has no photoreceptors. This is what causes the "blind spot."

The eyelid, eyelashes and eyebrows protect the eye. Tear ducts form tears that keep the eye moist and clean. There are six muscles that control eye movement. "

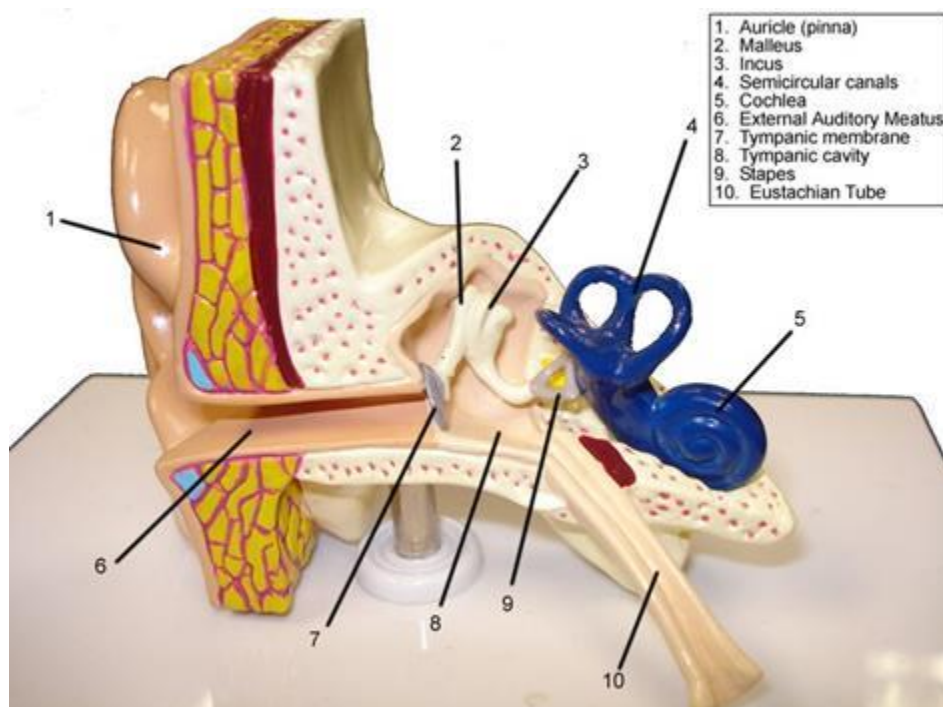
As complex as our eye is, hawks have many more cones and have vision 20 times more acute than humans.

Hearing

The auricles (outer ear) are responsible for picking up sound waves and sending them into the ear canal and to the tympanic membrane (ear drum); causing it to vibrate. These vibrations in turn cause small bones in the middle ear (**malleus, incus and stapes**) to vibrate. The hearing receptors in the inner ear carry these impulses to the brain.

The sense of hearing, like the sense of smell, can trigger emotions. When you hear a song on the radio you may recall the time and place where you first heard it. When I hear "U Can't Touch This" by MC Hammer it brings back memories of his crazy parachute pants. Are there any songs that stir memories or emotions for you?

Fluid in the inner ear helps us keep our balance giving us our equilibrium.



Touch

Most of our senses are perceived as a result of involuntary actions; our pupils dilate in a dark room to allow us to see in low light. These are the **autonomic neurons**. **Somatic neurons** receive impulses by our choice. The sense of touch is produced through millions of somatic neurons located in your skin.

Your brain can interpret several feelings of touch at once. For example when your dog greets you with a slobbery kiss, your brain can sense the texture and pressure of your best friend's tongue against your skin. It may also feel the sensations from the cold and wet tongue.

The sense of touch can trigger emotional responses as well. A pressure and warmth felt from a hug from a loved one can make you feel happy and reassured. A firm handshake can make you feel confident. A high-five can make you feel accepted and part of the team.

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Grading Rubric:

Your grade will be calculated by the sum of the points earned for each question. Points are earned according to the chart below.



To get a 10: A total score of 10 on your first submission, or within the first revision.

To get a 9: A total score of 9 or more after your first revision. Answers are written in complete sentences; all lesson requirements have been met.

To get an 8: A total score of 8 or more after your first revision. Answers are written in complete sentences; all lesson requirements have been met.

To get a 7: A total score of 7 or more on your third revision. Answers are written in complete sentences; all lesson requirements have been met.

To get a 6: A total score of 6 or more on your third revision. Answers are written in complete sentences; all lesson requirements have been met.

To get a 5: Any score lower than a 6 on the third revision. Lesson requirements have **not** been met.

Plagiarism – purposeful or mistaken, will lower your final grade for the course (So, be very careful when posting your work!)

Short Answer (Total content points possible = 6)	Answer is clearly written and complete. .5 point each	Answer is clearly written. May have 1 factual omission or error. .25 point each	Answer is not clearly written. There are several factual omissions or errors. 0 points each
Apply Your Knowledge (Total content points possible = 3)	Answer is clearly written and complete. Sources are cited. 1.5 points each	Answer is clearly written. May have 1 factual omission or error. Sources are cited. 1 point each	Answer is not clearly written. There are several factual omissions or errors. 0 points each
Organization, Grammar and Spelling (Total grammar points possible = 1)	Answered using complete sentences with no grammatical or spelling errors. 1 point	Answers may have up to 2 spelling and or grammar errors. .5 point	Contains more than 2 spelling and/or grammar errors. 0 points



Assignment:

You are to answer the following questions in your own words. Please post the questions with your answers in the text box below to submit your work. Remember to use complete sentences, use proper grammar, and don't forget to proofread and spell check your work before submitting it. This may require additional internet research, so be sure to cite your sources.

Do not submit text that you have copied from sources, including websites. All of your work should be in your own words. Using copied text would be considered plagiarism. For more information, review our page on [Plagiarism and Citation](#).

Short Answer - Your answers will be found in the lesson content. You will not conduct Internet research.

1. Give an example of how our sensory receptors can help us avoid or react to a dangerous situation.
2. Describe what gives food flavor? What senses are involved in a food's flavor?
3. What are volatile chemicals? What sense do they trigger? Give an example of a volatile chemical.
4. Name a smell that makes you associate a memory or emotion.
5. Describe the function of photoreceptors. Where are they found?
6. Describe in your own words the function of the following structures of the eye:
Cornea
Pupil
Lens
Cones
Optic nerve
Macula
7. If you are farsighted, your eyes are able to focus clearly on objects that are _____. (close or distant)
8. Where is the "blind spot, and what causes us to have it?
9. What are the three bones in the middle ear?
10. Give an example of a song that triggers a memory or emotion.



11. Where are most of your thermoreceptors found?
12. Describe the difference between autonomic neurons and somatic neurons.

Apply Your Knowledge

13. Do some Internet research (cite your sources) on the effect of smoking on your sense of smell and taste. Write 2-3 paragraphs describing how the sensory receptors are affected.
14. Do some Internet research (cite your sources) and write 2-3 paragraphs about how a dog's keen sense of smell can be used in crime detection.

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