

Name: _____

Nervous System

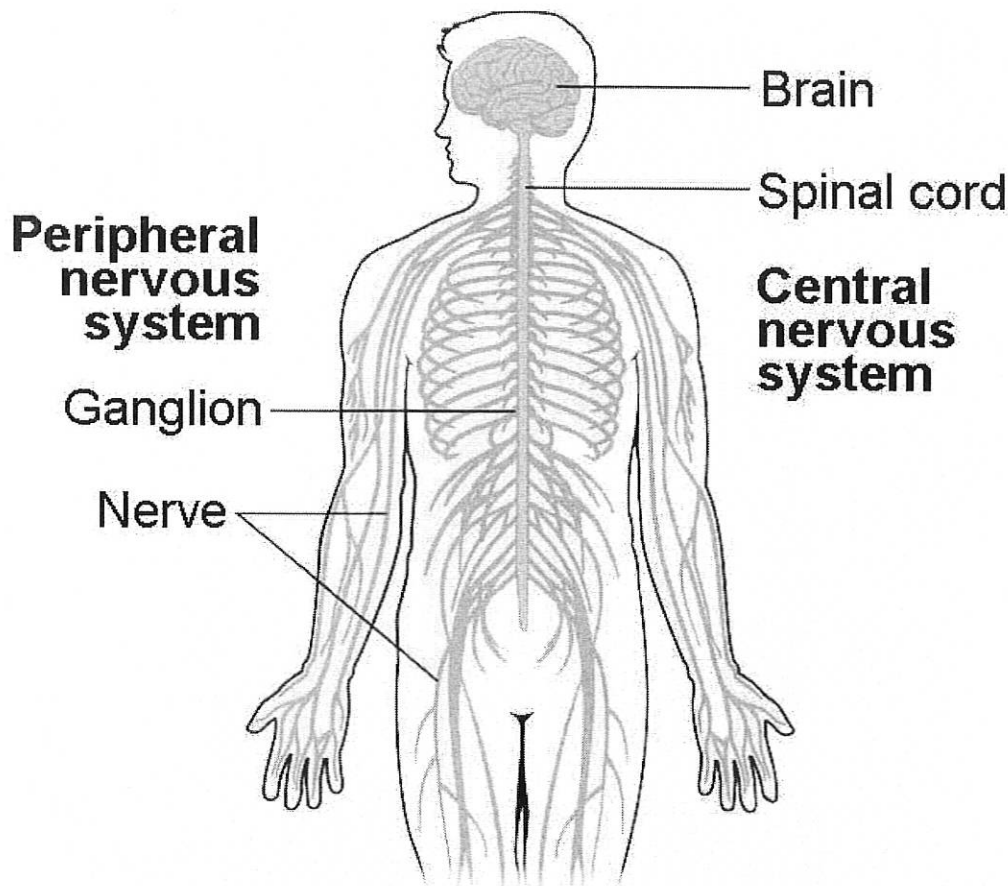
The nervous system is an organ system that consists of the brain, the spinal cord, and specialized cells called neurons. These components work together to gather information about the body and the environment, and react to those changes. The nervous system controls the body through electrical impulses that are transferred through neurons. Messages race along the neurons from the body to the brain and back again. Receptor cells in the body tell the brain what it is experiencing, and the brain sends back a message telling the body how to react. The entire process takes only a fraction of a second. The nervous system is divided into two parts: the central nervous system and the peripheral nervous system.

The central nervous system consists of the brain and the spinal cord and serves as the body's control center. It is responsible for interpreting signals coming from the body (the periphery) and controlling the body's response to stimuli. It receives sensory signals, interprets them, and makes decisions regarding movements or behaviors. In addition, in organisms with more developed central nervous systems, it is responsible for higher cognitive functions, such as reasoning, attention, and logic.

The spinal cord extends from the brain stem down the spine. The spinal cord provides a tract along which impulses can travel to and from the periphery to the brain. The spinal cord also contains some neurons that can facilitate reflex actions. Reflex actions are motor functions that you perform without conscious thought. For example, if you touch a hot stove, you automatically pull your hand back without thinking about it. The spinal cord processes these commands because it can act faster than sending the information to the brain and waiting for the brain to provide motor commands.

What is the nervous system?

System in the body that ties together a network of nerve cells and fibers that transmits nerve impulses between parts of the body. This allows the body to interpret messages from inside the body and to react to the environment around it.



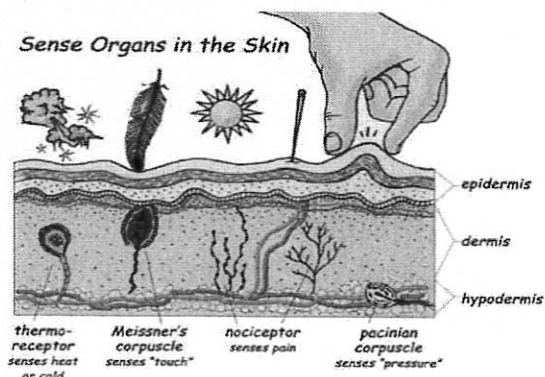
How does the brain receive, interpret and deliver messages?
https://www.ted.com/talks/the_cockroach_beatbox?language=en

What are sensory receptors?

Sensory Receptors are groups of specialized cells. They detect a change in the environment and stimulate electrical impulses in response. They are always “on” and keep you safe and help to navigate you in your environment.

Stimuli and Response - Notes

- Your body has SENSORY RECEPTORS that produce electrical impulses and respond to stimuli, such as changes in temperature, sound, pressure, and taste.



NERVOUS SYSTEM LAB PRACTICUM ACTIVITY 1: How Sensitive Are You?

Purpose: To learn which areas of the skin have more pressure sensors than others. Materials: paper clip paper and pencil ruler a partner

Procedure: 1. Straighten a paperclip and bend it into the shape of a U.

2. Make sure the tips are level with each other.

3. Now, ask your partner to close his/her eyes.

4. Arrange the ends of the clip 1 cm apart.

5. Touch both ends of the clip gently (and at the same time) onto the back of your partner's hand and ask if they only felt one pressure point or two.

6. If your partner felt only one pressure point, spread the tips of the paper clip and try again. Record the distance when your partner goes from feeling one pressure point to feeling two.

7. To make it difficult for your partner to guess the answer, watch both the distance between the tips, and whether you actually place one or both tips on their skin.

Body Part	Distance: One or Two?
Fingertips	
Forearm	
Cheek	
Palm	
Forehead	

Types of senses based on the distribution of their receptors

- Special senses; sensory receptors **localized in a special sense organ**

- Vision
- Hearing
- Equilibrium
- Taste
- Smell

- General senses; sensory receptors **widely distributed throughout the body**

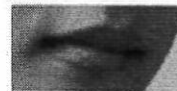
- Pressure
- Temperature
- Pain
- Touch
- Position



eyes



ears



sensory organs of taste



sensory organs of smell



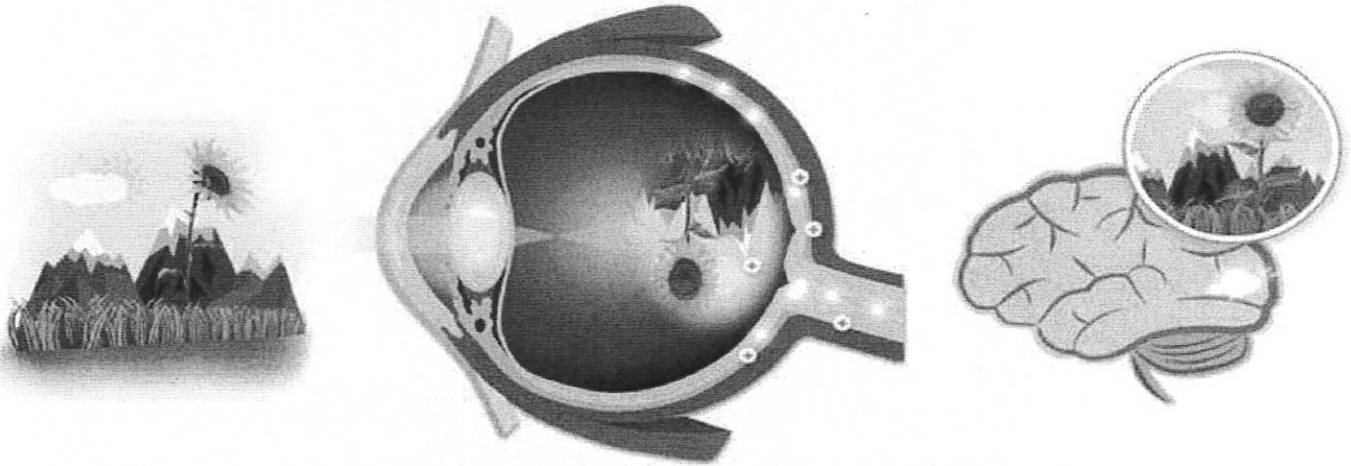
sensory receptors in skin, joints, muscles, and other parts of the body

What type of information do eye receptors detect?

<https://app.discoveryeducation.com/learn/videos/c1548d4c-3a95-4f83-8a64-d18d5c223e55/>

Electromagnetic Waves - Light

The Human Eye by  VisionDirect



An interactive guide to the human eye and how it works.
From the moment light enters the eye to the interpretation of an image in the brain.

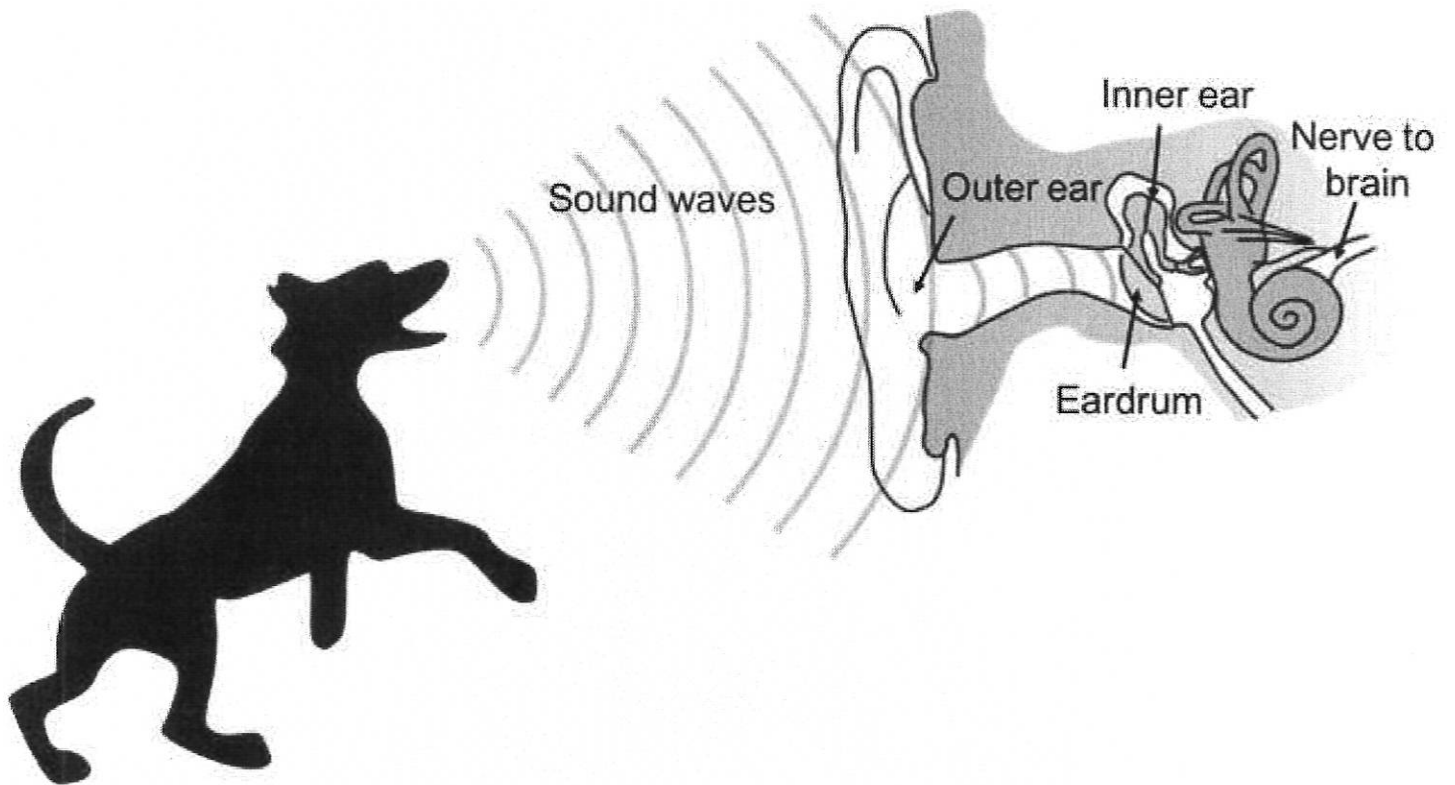
How fast are you?

1. Get a ruler.
2. Hold the ruler near the end (highest number) and let it hang down.
3. Have your partner put his or her hand at the bottom of the ruler and have them ready to grab the ruler. Their fingers should be 1 inch apart.
4. Drop the ruler and have your partner catch the ruler with their fingers.
5. Record the level in inches or centimeters at which they catch the ruler.
6. Test the person 3 to 5 times and then switch places.

Trial	Distance
#1	
#2	
#3	
#4	
#5	

What type of information do sensory receptors in the ears detect?

Mechanical vibrations from sound waves.

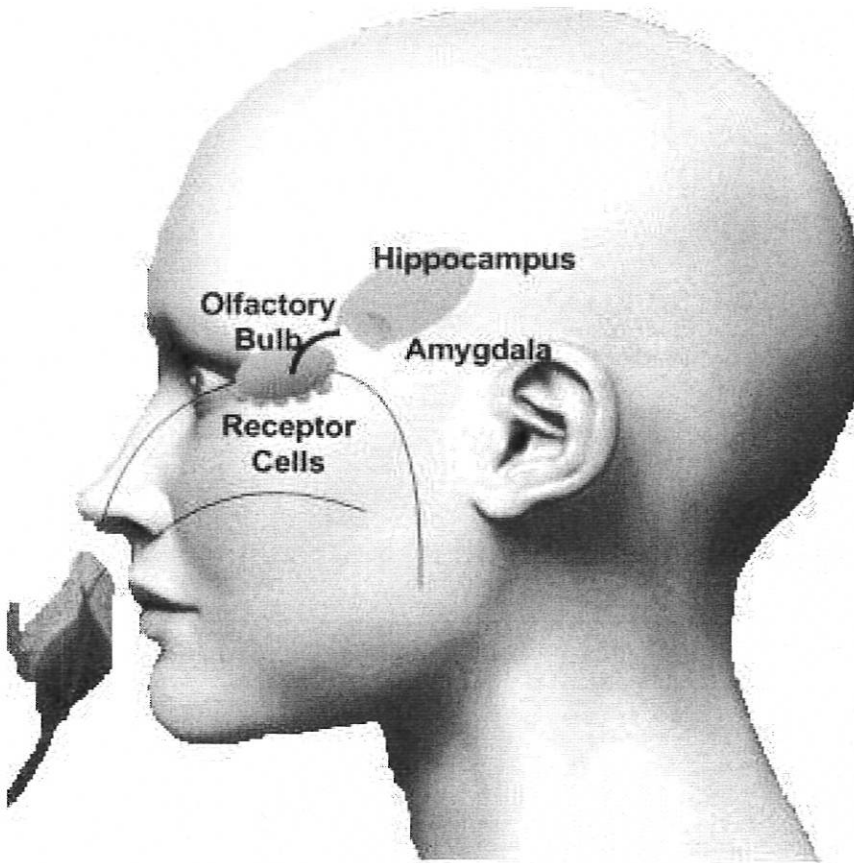


The Science of Hearing - TED TALK

<https://www.youtube.com/watch?v=LkGOGzpbrCk>

What type of information do nose receptors detect?

Chemical compounds found in the air.



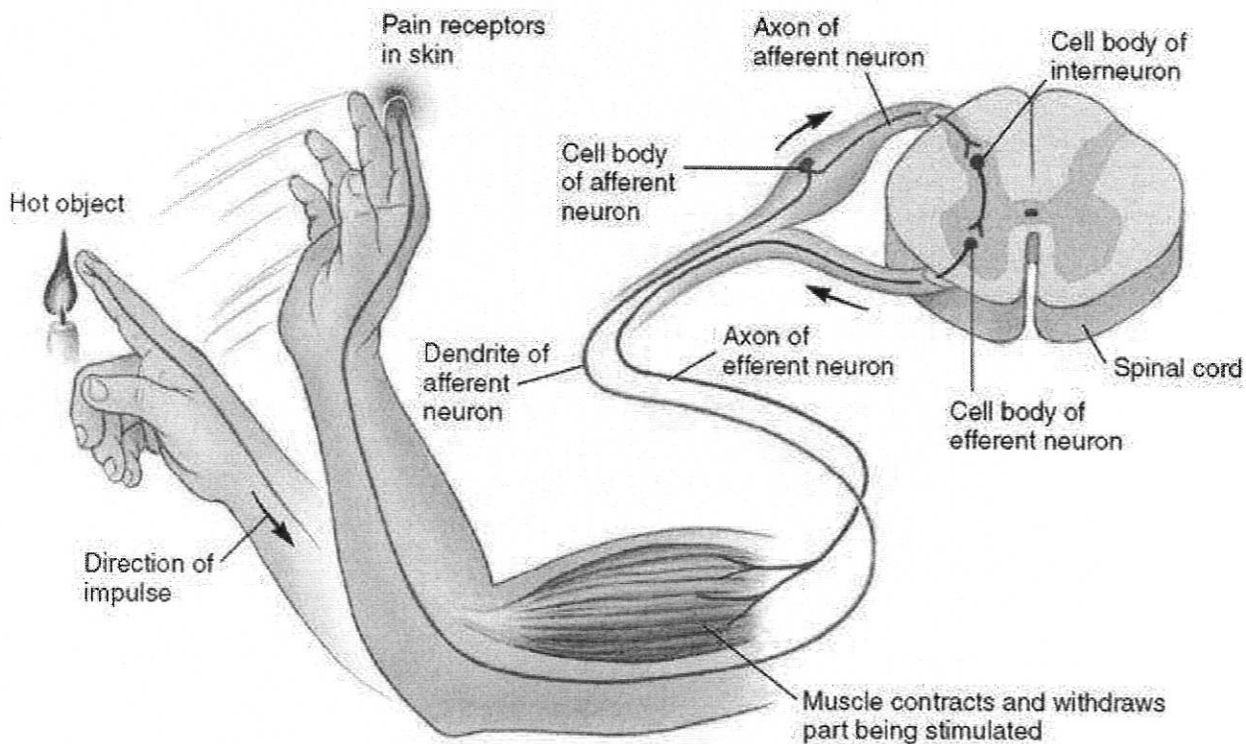
What's That Smell?

Bag #	Smell	Memory
#1		
#2		
#3		
#4		
#5		
#6		
#7		
#8		

How Do We Smell? <https://www.youtube.com/watch?v=snJnO6OpjCs>

What Happens When You Touch Something Hot?

Reflex is a special ability that evolution gifted us to facilitate our survival. Whenever part of your body comes in contact with an object capable of causing you harm, you tend to quickly withdraw that part of the body. This happens before your brain gets the time it needs to process the threat. If you accidentally touch a hot pot on your stove while cooking, you would involuntarily (and nearly instantaneously) snatch your hand away from the pot. This response is called a 'reflex action'. Contact with the hot pot triggers the start of a series of events in the body to evoke a response. At the point of contact with the hot pot, skin receptors quickly send nerve impulses (electrical) to the spinal cord (central nervous system) via sensory neurons. In the spinal cord, the impulses are processed and a response is relayed back. In the spinal cord, the interneurons (also known as relay neurons) make the connections between the sensory neurons (bringing the message from hand) and the correct motor neurons (taking the response back to the hand). It would not be useful if the response was sent to the wrong part of the body—in this case, a response sent to the leg wouldn't be too helpful as the stimulus is coming from the hand. From the interneurons, the response is relayed to the motor neurons which project out of the spinal cord to stimulate your muscles (effector) to contract, causing you to snatch your hand away from the hot pot. This pathway taken by nerve impulses to elicit a response is known as a 'reflex arc'. This process happens so fast that the response occurs before the message reaches the brain. This results to a quicker time-to-response as the thinking process of the brain may be relatively time consuming.



How does your brain respond to pain?

<https://www.youtube.com/watch?v=I7wfDenj6CQ>

What are memories and how does your brain store them?

The human brain has been called the most complex living structure known in the universe. Although it has the same general structure as the brains of other mammals, it is over three times as large as the brain of a typical mammal with an equivalent body size, and much more complex. It is a complex organ, with an estimated 100 billion neurons passing signals to each other via as many as 1,000 trillion synaptic connections.

It continuously receives and analyzes sensory information, responding by controlling all bodily functions and actions. It is also the center of higher order thinking, learning and memory, and gives us the power to think, plan, speak, imagine, dream, reason, and experience emotions.

Memory is the ability of our brain to recall information. When we think we have forgotten something, we really have either not stored it properly or cannot recall the information. Short-term memory receives information for a very limited time and usage. Examples include looking up a phone number to order a pizza and then forgetting it once it's used. If it is intended to be stored, we must organize it, repeat it, and work on moving it into our long-term memory. Long term memory is the capacity that allows us to recall information from day to day or a year later. This information has been organized and stored properly.

Although a memory begins with perception, it is encoded and stored using the language of electricity and chemicals. Nerve cells connect with other cells at a point called a synapse. All the action in your brain occurs at these synapses, where electrical pulses carrying messages leap across gaps between cells. The electrical firing of a pulse triggers the release of chemical messengers called neurotransmitters. These neurotransmitters diffuse and attach themselves to neighboring cells. Each brain cell can form thousands of links like this, giving a typical brain about 100 trillion synapses. The parts of the brain cells that receive these electrical impulses are called dendrites, feathery tips of brain cells that reach out to neighboring brain cells. Brain cells organize themselves into groups that specialize in different kinds of information processing. As one cell sends signals to another, the synapse between the two grow stronger. The more signals between them, the stronger the connection grows. The brain rewires itself with every new memory. The brain organizes and reorganizes itself in response to our experiences, forming new memories. Memories Impulses from the sensory cortex are conducted over interneurons to the prefrontal cortex of the cerebrum to be "recorded" as memories that associate the sight of a hot stove with pain. These memories cause you to be more careful when you are near a hot stove. But, most memories allow us to remember things to help us through our day or to remember previous experiences.

<https://www.youtube.com/watch?v=yOgAbKJGrTA>

Memory Study: Read or listen to a list of words given to you by your teacher.

You will have one minute to put them into your memory. Go!

ear	throne	focus	short	niece
sink	life	soda	mature	whole
friend	blade	jeans	hand	computer