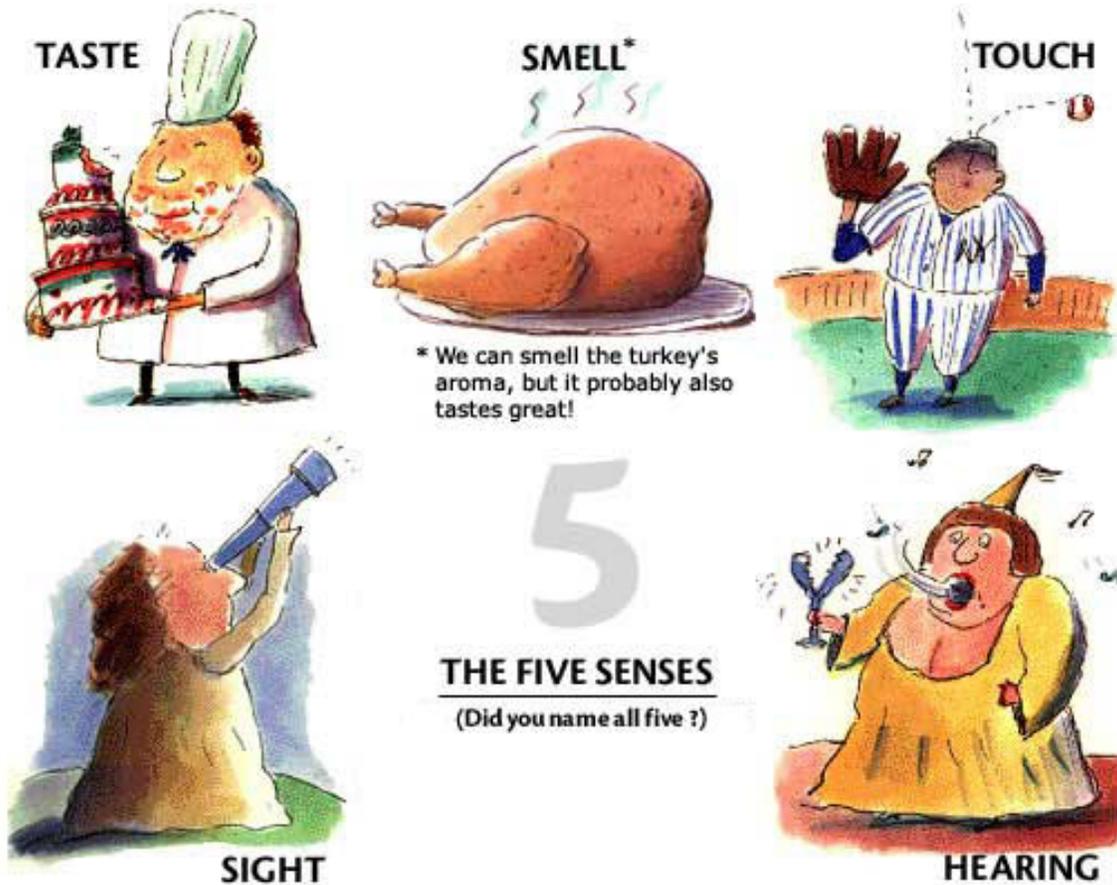


## Sensing the World Around Us



All animals have sense receptors, which are organs that receive information from the outside world. We human beings perceive our environment through our five senses: vision, hearing, smell, taste and touch.

Our bodies are covered with skin tissue. Our skin receptors deliver messages to our brains when our skin comes into contact with different surfaces. These receptors allow us to feel things like pain, temperature, pressure and vibrations. If you stick your bare hand into the snow, for instance, your sense receptors will signal the thing you have just touched is cold! *Very cold!* If you take a walk across the beach on a particularly sunny day without sandals on, your sense receptors may tell you that it is hot! *Very hot!* Once your brain has processed this information, it can store the information, and use it later on. The next time you go to the beach, you'll likely remember how much the sand can heat up, and bring your flip-flops along with you.

Pain is pretty unpleasant when it happens, but think about it this way: pain protects us. When we sense pain, we know that we should stop whatever it is we're doing, because it hurts. If you rest your hand on the stove while it's turned on, the pain will alert you to move away. Our sense receptors allow us to detect pain and tell our brains about injuries to our bodies. Memories of painful experiences help us avoid these experiences in the future. In other words, the information collected by our receptors can guide our future actions. Beware of the stove or get burned again!

What kinds of receptors allow us to see the world? The sense receptors involved in vision are called "photoreceptors." Other animals have different types of photoreceptors, but humans have only two kinds: rods and cones. Our rods and cones are located in the retina, the back part of the eye. Our rods are sensitive to changes in light, shape and movement. They help our eyes adjust to the dark. When you stumble to the bathroom in the middle of the night and, after a few moments, are able to see your door well enough not to bump right into it, those are your rods at work. Our cones allow us to perceive color. They operate best in bright light, which is why it's hard for us to make out colors when the lights are out. Some people are "color blind," which means that they have difficulty distinguishing certain colors from others, like red from green. This is because they're missing a type of cone in the retina, or because a particular cone is weak.

Olfactory receptors are the ones that receive smells, whether the scent of freshly baked cookies or day-old garbage. All that we smell is the result of receptors in our noses—about seven centimeters up our noses, actually!—detecting chemicals in the air and informing our brains. When you have a cold, the chemical molecules have a hard time reaching the receptors in your stuffed-up nose, which is why you have trouble smelling. Human beings have about forty million olfactory receptors, which are covered with small hairs called "cilia." A dog like the German Shepherd has about two billion olfactory receptors. That's why police officers often use dogs to sniff out whatever it is they're looking for; their sense of smell is much better developed than ours!

Did you know that, of all our senses, smell is the one most closely related to memories and emotions? When you smell an object that you've smelled before, it will often bring to mind memories associated with that object. Also, a lot of times we think we are tasting food when really we are mainly smelling it. Our olfactory receptors send signals to the brain while we're eating, and the brain registers this information as "taste."

Receptors in the ear, called “auditory receptors” or “hair cells,” are responsible for our hearing. Sound waves enter through our outer ear and cause the eardrum to vibrate. The three bones in our middle ear pass these vibrations on to the cochlea. The cochlea is a snail-shaped structure in the inner ear that is filled with a special fluid. When the vibrations move the hair cells (our receptors) on the cochlea, they send signals to the brain. Another fun fact: the canals in our inner ear are responsible for balance. So the next time you’re hopping up and down on one leg, remember that you have your ears to thank!

Humans enjoy five different types of taste: sweet, sour, salty, bitter and umami (savory or meatiness). Any other taste you can think of is made up of a combination of these. A human has approximately 10,000 taste buds. Each taste bud has 50 to 150 receptors. These receptor cells, or gustatory cells, only live for about two weeks and are then replaced by new ones. Your taste buds lie on your tongue, the back of the roof of your mouth and the back of your throat. Not all animals have the same receptors as we do. You’ll notice, if you ever try and reward your cat with something sugary, your pet doesn’t have much interest in candy. That’s because cats can’t taste sweets.

Certain animals sense their outside environment in incredible ways. Butterflies have taste receptors on their feet. A rabbit’s tongue contains 17,000 taste buds. Crickets hear using a thin membrane on their front legs. The box jellyfish has twenty-four eyes. Elephants can hear (and make) very low-frequency sounds that we humans can’t. Whether you taste with your feet or your tongue, hear with your legs or your ears, all of us animals need sense receptors. Without them, we wouldn’t know a thing about the world around us.

Name: \_\_\_\_\_ Date: \_\_\_\_\_

1. Which organ below is a sense receptor?

- A liver
- B stomach
- C skin
- D kidney

2. What does the author describe in this passage?

- A how our senses work
- B how to train a dog
- C how police officers catch thieves
- D how to be safe in the kitchen

3. If you rest your hand on the stove while it's turned on, the pain will alert you to move away. Our sense receptors allow us to detect pain and tell our brains about injuries to our bodies. Memories of painful experiences help us avoid these experiences in the future.

Based on this evidence, what conclusion can be made?

- A We need to try to forget our painful memories.
- B We can't always trust our sense receptors.
- C The brain is an important sense receptor.
- D Pain is unpleasant, but it can protect us.

4. Based on information in the text, how do memories form?

- A Olfactory receptors process and store information provided by the brain.
- B Photoreceptors process and store information provided by the brain.
- C Sense receptors process and store information provided by the brain.
- D The brain processes and stores information provided by sense receptors.

5. What is this passage mainly about?

- A the benefits of blindness
- B the habits of animals
- C the five senses
- D the five tastes

6. Read the sentence: **Olfactory** receptors are the ones that receive smells, whether the scent of freshly baked cookies or day-old garbage.

As used in the passage, what does the word “**olfactory**” mean?

- A connected to the act of storing garbage
- B connected to the act of baking cookies
- C connected to the sense of smell
- D connected to the sense of taste

7. Sound waves enter through our outer ear and cause the eardrum to vibrate. \_\_\_\_\_, the three bones in our middle ear pass these vibrations on to the cochlea.

Choose the answer that best completes the sentence below.

- A Previously
- B Then
- C Obviously
- D Meanwhile

8. Why do police officers use dogs to sniff out whatever it is they're looking for?

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9. Should a cat be rewarded with a sugary treat? Why or why not? Use evidence from the story to support your answer.

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10. Human beings see, smell, taste, and hear in ways that are different from other animals. What evidence from the text supports this conclusion?

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**Teacher Guide & Answers****Passage Reading Level:** Lexile 970**1.** Which organ below is a sense receptor?

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8. Why do police officers use dogs to sniff out whatever it is they're looking for?

**Suggested answer:** Their sense of smell is much better developed than ours. Students may also note that dogs have many more olfactory receptors than we do.

9. Should a cat be rewarded with a sugary treat? Why or why not? Use evidence from the story to support your answer.

**Suggested answer:** No, because cats can't taste sweets.

10. Human beings see, smell, taste, and hear in ways that are different from other animals. What evidence from the text supports this conclusion?

**Suggested answer:** Answers may vary but should include any of the following:

Other animals have different types of photoreceptors, but humans have only two kinds: rods and cones.

Human beings have about forty million olfactory receptors. A dog like the German Shepherd has about two billion olfactory receptors.

Not all animals have the same receptors as we do. For example, cats can't taste sweets.

Butterflies have taste receptors on their feet. A rabbit's tongue contains 17,000 taste buds. Crickets hear using a thin membrane on their front legs. The box jellyfish has twenty-four eyes. Elephants can hear (and make) very low-frequency sounds that we humans can't.