


# MODULE 1: SPECIAL SENSES

## An Introduction to Special Senses

When we refer to the special senses, we are referencing the senses that have specialized organs devoted to them. This generally means taste (the tongue), smell (the nose), vision (the eyes) and hearing (the ears). This module will include some activities and require some research that will help you understand and appreciate the anatomy and function of these special senses. There will be an online worksheet that you will enter your answers on. You will be allowed to "Save for Later" and "Submit" the worksheet as many times as you want. However, there are a couple of things to keep in mind.

1. You will not be allowed to Submit your worksheet after the deadline. If you do not submit before the deadline, you may be able to work out a way to submit it as a late assignment but there will be point deductions.
2. If you Submit the lab assignment, and then decide to retake it before the deadline, all of your answers will be gone and you will have to retype all answers before submitting again.

The lab worksheet has been reproduced for you on the following pages, so that you can work on things offline. If you have printed the lab manual, you might write notes in the textbox fields, or you might use a .pdf document annotator on your computing device. Whatever you decide to do is fine, but ultimately, only answers entered on the I-learn worksheet can be submitted for grading. Remember that the link to this worksheet looks like this...

 [Module 1: Special Senses Lab Worksheet](#)



Follow the instructions below very carefully. Many of the items in this assignment require reading or videos or something else to do. Be sure to write your answers completely before submitting the assignment. There is an option in the bottom right to save your answers and come back later, but once you submit this assignment, it will be graded.

## Taste

There are five basic modalities of taste: sweet, sour, salty, bitter and umami (the amino acid glutamate). Tastes of different substances are composed of different combinations of these 5 basic modalities combined with nuances from our sense of smell. **\*\*Note:** the spiciness of hot peppers is generated by the chemical capsaicin, capsaicin does not activate any specific taste receptor cells. Capsaicin does stimulate pain receptors in the mouth however (probably why my youngest child always said ouch when eating jalapenos). While only 5 basic modalities exist for taste (and some pain receptors for spiciness) humans can distinguish among many hundreds of different chemicals with their taste buds. We as humans do have a lot of variability when it comes to how sensitive to flavors we are.

[CLICK HERE](#) to read an article about "supertasters"

[CLICK HERE](#) to watch a video about "supertasters"

If you are attending the face to face lab on campus, follow your teacher's instructions on how to test yourself for taste sensitivity. If you are doing this lab strictly online [CLICK HERE](#) and follow all the instructions.

1. Did you complete the activities above?

- Yes
- No

2. About 25% of the population are "under-tasters". 50% are "normal" tasters and the rest are some degree of "supertaster". What do you think you are? Did this activity verify or refute what you already thought about your tasting ability. Explain.

3. John and Jane are in anatomy and physiology lab. They are coloring their tongue to see if they are supertasters or not. John states that he can see nearly 20 taste buds on Jane's tongue within the circumscribed circle. Jane says, "No way, you can't see taste buds with the naked eye, they are too small". John says "yes, you can, they are bright pink, just like we were told they would be". Who is right? Explain.

---

## Smell

The sense of taste and smell are closely tied together. For example, it has long been known that if you have someone close their eyes and eat a piece of apple and then a piece of potato, they can easily tell the difference between the two. However, if you have this person plug their nose, the apple and potato taste much more similar (especially if both are peeled and the pieces are small).

Phil and Mary have just been called to be the new nursery leaders. They love kids and look forward to the challenge every Sunday. One Sunday, four kids ended up in dirty diapers all at the same time! Phil and Mary had their hands full. After recruiting the parent's help and getting things cleaned up they were pretty tired. Several minutes went by while they quieted the kids down with a gospel story. One of Phil's friends poked his head in, wrinkled his nose and exclaimed "it smells like you two have been busy". Phil sniffed and thought it strange that he didn't smell anything unpleasant at that moment.

4. Do your own research and answer the question "How come we can be around unpleasant smells and then after a while they diminish or are gone"? The more detailed and biologically correct your answer, the more points.

# Eyes and Vision

The eye is a complex organ, capable of performing multiple tasks that not only enable you to see objects clearly, but that also allow you to follow objects in motion. The structures of the eye allow it to automatically adjust its focus on objects and control the amount of light entering the eye. All of these activities must occur within very short periods of time. Deviations in shape, muscular strength, or neural activity affect vision. The following exercises will test some of the physiological properties of the eye and of vision.

Visual acuity is the ability to distinguish between two nearby points and it is frequently tested by means of the "**Snellen Eye chart**". Acuity depends on several factors that include the density of photoreceptors in the eye and the precision of the eye's refraction. A person with normal vision can read the line marked 20/20 on the Snellen eye chart at 20 feet. An individual with 20/40 visual acuity must stand 20 feet away from the chart to read a line that a normal person can read at 40 feet. A person with 20/40 visual acuity has myopia (nearsightedness) and a far sighted person has a decreased ability to see near objects. If you are attending the face to face on campus lab, your instructor will show you where the Snellen Eye charts are. Keep in mind that the tile sections on the floor are 1 foot by 1 foot. This will help you measure 20 feet. If you are doing this lab strictly online, then [CLICK HERE](#) to get a Snellen Eye Chart. You will need to print it and do your measurements at home.

5. What is your visual acuity in each eye? After recording these values in the box below, do your own research and explain what the visual acuity is to be "legally blind". Finally, in this same box, describe what it might be like to be legally blind. "Google" the key phrase "what is it like to be legally blind" and you will get a bunch of websites to draw from.

6. For this next activity, we want you to try to experience what legal blindness might feel like. In the last essay, you tested your visual acuity and you researched the numerical value for legal blindness. One way to artificially decrease visual acuity is to look through glass or plastic that has vasoline on. For this activity, locate a pair of old glasses or safety goggles (actually any transparent item can work). If you are in the face to face lab, your instructor will provide materials for you. Now, device a way to most accurately create your experience. Remember, we want you to apply enough vasoline that you could see at 20 feet about the same thing a legally blind person would see. Describe what you came up with to accurately mimic legal blindness (in other words, how did you know you had the right amount of vasoline?). Next, try to perform a functional activity with your legal blind "glasses" (Don't drive though!!). Explain what functional activity you did and the troubles you had. As always with these questions, make it a good essay.

---

## Visual Accommodation

Since the human lens is elastic, its degree of convexity and, therefore, its refractive power can be altered by changing the tension placed on it by the suspensory ligaments. The ability of the lens to bring objects into focus at different distances from the lens is called accommodation. Visual Accommodation can be tested by measuring the near point of vision.

7. First, [CLICK HERE](#) to watch an animation of how the eye accommodates for near and far vision. Second, place a ruler just under one eye with the stick extended outward. Close the other eye. Hold a pen or pencil at arm's length against the ruler and gradually bring it forward. **Note:** Using a colored tip on the pen will help you distinguish resolution. Notice the distance at which the object first appears blurred or doubled. Repeat this procedure for the other eye. In the textbox below input your near point of vision for each eye. Accomodation becomes more difficult as a person ages. This is called presbyopia. Research presbyopia and describe what it is and how it occurs.




## Visual Astigmatism

The astigmatism chart consists of a number of dark lines radiating from a central point like the spokes of a wheel. If an astigmatism is present, some of the spokes will appear blurred and / or lighter because they are focused either in front of or behind the retina.

If you are attending the on campus face to face lab, your lab instructor will help you locate and use the test for astigmatism. If you are doing this lab strictly online [CLICK HERE](#) to take an online astigmatism test.

Many students have been told that they have an astigmatism and that their glasses have been made to correct for this. If you think you have an astigmatism and you wear glasses, try the astigmatism test again with your glasses on. You should notice an obvious change in the darkness of one set of lines compared to the other. **Note:** If astigmatism has been corrected with glasses, this can be verified by holding the glasses in front of your face while rotating the glasses 90 degrees. The darkness of one set of lines will change when the glasses are rotated.

8. After completing the astigmatism test above, do your own research and explain what an astigmatism is and the ways that it can be corrected.



---

## Visual "Blind Spot"

The axons of all the ganglion cells exit the retina at the optic disc. The optic disc is also called the blind spot because there are no rods and cones in this area and therefore an object focused on this area will not be seen.

If you are attending the on campus lab, your instructor will give you a printed sheet of paper that has the "blind spot" test on it. If you are doing this lab strictly online [CLICK HERE](#) to find your "blind spot".

9. Do your research now and explain the following in the textbox below:

- What is a "blind spot", what causes a "blind spot".
- If we have a "blind spot" in both eyes, why do we not see two "empty spaces" in our vision all the time? Or do we? Explain.

---

## Ears and Hearing

The structures of the ear act to transduce vibrations into electrical impulses that can be transmitted to the brain. Initially, sound waves vibrate the tympanic membrane followed by the three middle ear ossicles, which amplify the vibrations (without altering sound wave frequency). These amplified vibrations are then transmitted into the inner ear chambers of the cochlea where they stimulate groups of small nerve hair cells.

For this next activity, find something that vibrates and makes a sound. If you are in the campus lab, your instructor will provide a tuning fork for you and show you how to use it. If you are doing this lab strictly online, you can use a radio speaker playing music, an electric toothbrush or something similar (as long as it produces a soft sound continuously - you don't want it to be very loud). Use

your tuning fork or device to produce sound and plug your ears and close your eyes. If you hold the tuning fork or other device out away from you, it should be difficult or impossible to hear a sound. Now, hold the device against your forehead and notice how well you can hear the sound when your skull bone is touching the device. Sound travels well through bone and can enter your cochlea from the surrounding bone.

[CLICK HERE](#) and watch the two videos that explain conductive and sensorineural hearing loss. After watching these videos, answer the questions below.

10. If a person were to rupture their ear drum, which type of hearing loss would they experience?

Did you complete the activities above?

- Conductive Hearing Loss
- Sensorineural Hearing Loss

11. If a person were to dive very deep in the ocean and get a substantial amount of water trapped in the middle ear, which type of hearing loss might they be at risk for?

- Conductive Hearing Loss
- Sensorineural Hearing Loss

12. Could a person who had no ossicles still hear sound if they touched their forehead to the sound making device? Explain.

---

## Echo Location

Echolocation is the ability to detect objects in the environment by sensing the echoes coming from those objects. Humans can sometimes teach themselves very basic navigation by creating sounds with their mouth, canes, hands or other devices.

[CLICK HERE](#) and watch this video about echolocation.



13. Do some research and explain how a person is using their hearing to accomplish echolocation. Be specific and write a good essay.

## Ophthalmoscope and Otoscope

[CLICK HERE](#) to learn how to use an ophthalmoscope.

[CLICK HERE](#) to learn how to use an otoscope

If you are in the campus lab, your instructor will give you instructions on how to use the ophthalmoscope and otoscopes. Please follow all instructions carefully so that no injury occurs. If you are doing the lab strictly online, you should still watch the videos so that you don't miss any questions on the lab exams.

- Yes
- No