

Chapter 10 Somatic and Special Senses

Receptors, Sensations and Perception:

Sensory receptors detect changes in the environment and stimulate neurons to send nerve impulses to the brain. Sensory Receptors are one of two categories: _____ or _____

Types of Receptors: Each receptor is more sensitive to a specific kind of environmental change but is less sensitive to others. List the five main types of receptors and describe the environmental change that each type is most sensitive to.

Sensations and Perceptions: _____ are feelings that occur when the brain interprets sensory impulses.

What does the term projection mean when referring to the brain and sensations?

During sensory _____, sensory impulses are sent at decreasing rates until receptors fail to send impulses unless there is a change in strength of the stimulus.

General Senses

Receptors associated with the skin, muscles, joints, and viscera make up the somatic senses.

Pressure and touch: Three types of receptors detect touch and pressure.

_____ ends of sensory nerve fibers in the epithelial tissues are associated with touch and pressure.

_____ corpuscles are flattened connective tissue sheaths surrounding two or more nerve fibers and are abundant in hairless areas that are very sensitive to touch, like the lips.

_____ are large structures of connective tissue and cells that resemble the layers of an onion. They function to detect deep pressure.

Draw these receptors.

Temperature: receptors include two groups of free nerve endings: _____ receptors and _____ receptors which both work best within a range of temperatures. Both types of receptors adapt quickly. Temperatures near 45° C stimulate pain receptors; temperatures below 10° C also stimulate pain receptors and produce a freezing sensation.

Pain: Pain receptors consist of _____ nerve endings that are stimulated when tissues are damaged. Do they adapt easily?

_____ pain occurs because of the common nerve pathways leading from skin and internal organs. An example would be a heart attack being felt as pain in the arm or as heartburn.
What is the difference between acute and chronic pain? How do their neurons differ?

Regulation of pain: A person becomes aware of pain when impulses reach the _____ in the brain, but the _____ cortex judges the intensity and location of the pain.
Other areas of the brain regulate the flow of pain impulses from the spinal cord and can trigger the release of chemicals called _____ and _____, which inhibit the release of pain impulses in the spinal cord.
Other chemicals called _____ released in the brain provide natural pain control.

Special Senses: These include the senses of smell, taste, hearing, static equilibrium, dynamic equilibrium, and sight.

Smell = Olfaction:

Olfactory organs: what type of receptor are the olfactory receptors? Where are they located?

The receptor cells are _____ neurons with hair-like _____ covering the dendrites. These project into the _____ cavity.

Nerve pathways: When olfactory receptors are stimulated, their fibers synapse with neurons in the _____ lying on either side of the crista galli.

Olfactory Stimulation

Scientists are uncertain of how olfactory reception operates but believe that each odor stimulates a set of specific protein receptors in cell membranes. The brain interprets different receptor combinations as an olfactory code.

Do olfactory receptors adapt easily?

Taste:

Taste _____ are the organs of taste and are located within bumps called _____ of the tongue.

Taste receptors Taste cells (gustatory cells) are modified _____ cells that function as receptors.

Taste cells contain the taste _____ that are the portions sensitive to taste. These protrude from openings called taste _____.

What has to happen to chemicals before they can be tasted (or smelled)?

How many types of taste receptors are there believed to be? Do taste receptors easily adapt?

Nerve pathways: Taste impulses travel on which three cranial nerves?

They travel to the _____ in the brainstem and then to the gustatory cortex of the _____.

Hearing:

The ear has external, middle, and inner sections and provides the senses of hearing and equilibrium.

External ear: The external ear consists of the _____ which collects the sound with then travels down the _____ towards the middle ear.

Middle ear: The middle ear begins with the eardrum called the _____, and is an air-filled space (tympanic cavity) housing the tiny bones called the _____.

What are the names of the three bones?

What happens when the eardrum vibrates against the first of the three bones?

What opening does the last of the bones push against?

The _____, or _____, tube connects the middle ear to the throat to help maintain equal air pressure on both sides of the eardrum.

Inner ear: The inner ear is made up of a _____ labyrinth inside a/an _____ labyrinth.

Between the two labyrinths is a fluid called _____.

_____ is a fluid inside the inner labyrinth.

Cochlea: Within the cochlea, the oval window leads to the upper compartment, called the _____, the lower chamber is called the _____.

The cochlear duct lies between these two compartments and is separated from the lower one by a membrane called the _____ membrane.

The Organ of _____ lies on this membrane. It has receptors called _____ cells.

There is a stiff, partial, overhanging membrane in which the ends of these hair cells are embedded. This membrane is called the _____ membrane.

The path of vibration:

The _____ funnels the sound as air waves into the _____ which channels it to the eardrum called the _____.

This membrane vibrates converting the impulses to mechanical waves. This moves the three auditory ossicles, which are (in order) _____ and _____.

Moving these ossicles will amplify the sound. The last one, the _____, pushes in on the _____ window of the inner ear.

This sets up waves in the fluid of the inner ear and causes the flexible lower membrane called the _____ to move.

The Organ of Corti rests on this membrane so it also moves, causing the _____ cells to bend because they are also embedded in the stiff _____ membrane. This bending causes a nerve impulse.

Different areas of the basilar membrane react to different sounds.

Nerve pathways: Nerve fibers carry impulses to the auditory cortices of the temporal lobes where they are interpreted.

Equilibrium:

The sense of equilibrium consists of two parts: _____ and _____ equilibrium.

Static Equilibrium:

The organs of static equilibrium are located within the bony _____ of the inner ear, inside two expansions of the membranous labyrinth called the _____ and _____.

A _____, consisting of hair cells and supporting cells, lies inside these sacs.

The hair cells are inside a gelatinous material that also contain tiny stones called _____.

When the head changes position, gravity causes the gelatin and stones to shift, bending hair cells and generating a nervous impulse.

Nerve pathways: Impulses travel to the brain via the _____ branch of the _____ nerve, indicating the position of the head.

Dynamic Equilibrium:

The three _____ detect motion of the head, and they aid in balancing the head and body during sudden movement.

The organs of dynamic equilibrium are called cristae _____, and are located in the bulbous _____ of each canal of the inner ear. They are at right angles to each other.

Hair cells extend into a dome-shaped gelatinous cupula.

Rapid turning of the head or body generates impulses as the cupula and hair cells bend. Also, mechanoreceptors (called _____) associated with the joints, and the changes detected by the eyes also help maintain equilibrium

Vision

Accessory Organs:

Accessory organs, namely the lacrimal apparatus, eyelids, and extrinsic muscles, aid the eye in its function. The _____ protects the eye from foreign objects and is made up of the thinnest skin of the body.

The _____ apparatus produces tears that lubricate and cleanse the eye. Two small ducts drain tears into the nasal cavity. Tears also contain an antibacterial enzyme called _____.

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| <p>The six _____ muscles of the eye attach to the sclera and move the eye in all directions.</p> |
| <p>Structure of the Eye:</p> <p><u>Outer Layer:</u> The outer (fibrous) layer is the transparent _____ at the front of the eye, and the white _____ on the exterior of the eye.</p> |
| <p><u>Middle Layer:</u> The _____ coat is highly vascular and darkly pigmented and performs two functions: to nourish other tissues of the eye and to keep the inside of the eye _____.</p> <p>The _____ body forms a ring around the front of the eye. What is its function?</p> <p>The _____ chamber (between the cornea and iris) and the _____ chamber (between the iris and vitreous body and housing the lens) make up the _____ cavity, which is filled with a fluid called _____ humor.</p> |
| <p><u>Lens:</u> What is the ability of the lens to change its shape called? Why is this important?</p> |
| <p><u>Adjusting for light and dark conditions:</u> The _____ is a thin, smooth muscle that adjusts the amount of light entering the _____ a hole in its center.</p> <p>The iris has two types of fibers, what are they?</p> |
| <p><u>Inner layer:</u> The inner tunic consists of the _____, which contains photoreceptors; The inner tunic covers the back side of the eye to the ciliary body.</p> <p>In the center is the yellow area, the _____ with the _____ in its center, the point of sharpest vision in the eye.</p> <p>Medial to this area is the _____, where nerve fibers leave the eye resulting in a blind spot.</p> <p>The large cavity of the eye is filled with gel-like _____ humor.</p> |
| <p><u>Refraction:</u> Light waves must bend to be focused, a phenomenon called refraction.</p> <p>What four parts of the eye do this?</p> |
| <p><u>Visual receptors:</u> Two kinds of modified neurons comprise the visual receptors; elongated _____ and blunt-shaped _____. Which is responsible for color vision? Which is responsible for B and W vision? Which is more acute and why?</p> |
| <p><u>Visual Pigments:</u> The light-sensitive pigment in rods is _____, which breaks down into a protein, opsin, and retinal (from vitamin A) in the presence of light. How does this work?</p> <p>The light-sensitive pigments in cones are also proteins; There are _____ sets of cones, each containing a different visual pigment. How does this work?</p> <p>The color perceived depends upon which sets of cones the light stimulates:</p> <p style="padding-left: 40px;">If all the sets are stimulated, the color is _____;</p> <p style="padding-left: 40px;">If none are stimulated, the color is _____.</p> |

Visual nerve pathways: The axons of ganglion cells leave the eyes to form the _____ nerves.

Fibers from the medial half of the retina cross over in the optic _____.

Impulses are transmitted to the thalamus and then to the visual _____ of the _____ lobe.