Sensory System Outline

1. Sensory Receptors
   1. Sensory receptors are structures that are specialized to detect and respond to changes in the environment.
   2. We use the word *perception* to describe the conscious awareness of sensations.
   3. Most types of sensory receptors gradually stop responding when they are continuously stimulated. This phenomenon is called sensory adaptation.
      1. For example, the musty smell of an antique store may be obvious to a person who just walked in, but the salesclerk working in the store no longer notices it.
      2. Receptors for pressure and touch adapt more quickly. For this reason, we quickly become unaware of the feeling of our clothing on our skin.
2. Classes of Receptors
   1. Mechanoreceptors
      1. Receptors responsible for the sensation we describe as touch, pressure, hearing and equilibrium.
   2. Thermoreceptors
      1. Receptors that detect changes in temperature.
   3. Photoreceptors
      1. Receptors responsible for the detection of light intensity.
   4. Chemoreceptors
      1. Receptors that respond to chemicals
         1. Specialized for tastes as well as the monitoring of specific substances such as Carbon Dioxide, Oxygen, or glucose in our body fluids.
   5. Pain Receptors
      1. Receptors that respond to very strong stimuli that usually result from physical or chemical damage to tissues.
   6. The general senses—touch, pressure, vibration, temperature, body and limb position, and pain.
   7. The special senses—vision, hearing, the sense of balance or equilibrium, smell, and taste.
3. The General Senses
   1. Touch, Pressure, and Vibration
      1. Involved with the Mechanoreceptors, responding to any stimulus that stretches, compresses, or twists the receptor membrane.
      2. Other pressure receptors monitor internal conditions, including blood pressure.
      3. Several types of receptors detect light touch.
         1. For example free nerve endings wrapped around the base (bulb) of the fine hairs on the skin detect and bending of those hairs.
      4. Meissener’s corpuscles are encapsulated nerve endings just under the skin that tell us where we have been touched.
         1. They are common on the hairless, very sensitive areas of skin, such as the lips, nipples, and fingertips.
      5. Ruffini Corpuscles are encapsulated endings that respond to continuous pressure.
   2. Tempurature Change
      1. Thermoreceptors respond to changes in tempurature.
         1. One type responds to cold and another responds to warmth.
            1. The fading of a hot or cold sensation so rapidly is caused by the extreme activeness of thermoreceptors. The fading occurs because thermoreceptors are very active when temperature is changing but adapt rapidly when tempurature is stable.

For example, the hot tub is scalding at first, but very soon it feels comfortably warm.

* 1. Body and Limb Position
     1. When you are at rest or in motion, the brain “knows” the location of all your body parts
     2. Muscle spindles are specialized muscle fibers wrapped in sensory nerve endings that monitor the length of a skeletal muscle.
     3. Golgi tendon organs –highly branched nerve fibers located in tendons (connective tissue bands that connect muscles to bones)—measure the degree of muscle tension.
     4. The brain combines this information to make coordinated movements.
  2. Pain
     1. When tissue is damaged, cells release chemicals that alert the free nerve endings of the injury.
        1. Aspirin and ibuprofen reduce pain by interfering with the production of one of the released chemicals.
     2. Internal organs have pain receptors as well, and they are sometimes perceived as pain in an uninjured region of the skin, this is called referred pain.
     3. Pain is an important mechanism that warns the body and protects it from further injury.

1. Vision
   1. The eye is the main structure of vision
      1. The wall of the eyeball consists of three layers: the Sclera and cornea; the choroid, ciliary body, and iris; and the retina.
         1. Sclera; the white of the eye.
         2. Cornea; transparent window in which light enters the eye and bulges slightly outward.
         3. Choroid; a layer containing many blood vessels that supply nutrients and oxygen to the tissues of the eye.
         4. Ciliary body; a ring of tissue, primarily muscle that encircles the lens.
         5. Iris; The colored portion of the eye
            1. Pupil; the opening in the center of the iris through which light enters the eye
         6. The Retina; the innermost layer of the eye, contains almost a quarter-million photoreceptors
   2. Types of medical conditions for sight
      1. Farsightedness: Distant objects are seen more clearly than nearby ones because the eyeball is too short or the lens is too thin, causing nearer images to be focused behind the retina.
         1. Nearsightedness: occurs when the eyeball is elongated or when the lens is too thick. Causing the image to focus in front of the retina.
      2. Treatment
         1. Many people who are tired of depending on glasses or contact lenses have opted to undergo laser eye surgery. This procedure is popularly known as LASIK, which stands for laser-assisted in situ keratomileusis.
         2. LASIK permanently changes the shape of the cornea.
   3. Light and Pigment Molecules
      1. The function of the eye’s receptors, both rods and cones, is to respond to light by sending neutral messages to the brain, where they are translated into images of our surroundings.
         1. Rods: more numerous than the cones and are the photoreceptors responsible for black and white vision.
         2. Cones: The photoreceptors responsible for color vision. Unlike rods, the cones produce sharp images.
      2. Color blindness is a condition in which certain colors cannot be distinguished from each other.
2. Hearing
   1. In every instance, what we hear are sound waves produced by vibration.
   2. The loudness of sound is determined by the amplitude of the sound wave, represented graphically as the distance between the top of the peaks and the bottom of troughs.
      1. The pitch is determined by the frequency of the waves.
   3. Form and Function of the Ear
      1. Three main parts: Outer Ear, Middle Ear, and Inner Ear
         1. The outer ear is a receiver
         2. The middle ear serves as an amplifier, with three tiny bones called the malleus (hammer), Incus (anvil), and the staples (stirrup).
         3. The inner ear is a transmitter. Sends neural messages to the brain.
      2. Unequal pressure in the ear is usually alleviated by the auditory tube (also known as the Eustachian tube).
      3. The inner ear has two sensory organs, only one of which, the cochlea, is concerned with hearing. The other sensory organ, the vestibule apparatus, is concerned with sensations of body position and movement.
   4. The loudness and pitch of sound that we hear is entirely based on the amplitude and frequency to sound waves that enter our ears.
   5. Hearing Loss
      1. An estimated 28 million Americans have some sort of hearing loss.
      2. There are two types of hearing loss: conductive hearing loss and sensorineural loss
      3. Hearing can be damaged by sound that is loud enough to make conversation difficult.
   6. Ear infections
      1. Swimmer’s ear, the most common type of ear infection, is caused by a buildup of precipitated water trapped in the canal.
   7. Balance
      1. The vestibule Apparatus, a fluid filled maze of chambers and canals within the inner ear, is responsible for monitoring the position and movement of the head.
3. Smell and Taste
   1. You have millions of olfactory (smell) receptors located not in the nostrils, but in a small patch of tissue the size of a postage stamp in the roof of each nasal cavity.
      1. Olfactory cells are one of the few kinds of neuron known to be replaced during life -- (every 60 days).
   2. We have about 1,000 types of olfactory receptors, with which we can distinguish around 10,000 distinct odors.
      1. There are 5 primary tastes: sweet, salty, sour bitter, and umami (savory).
   3. Most taste buds are located on the tongue, however some re scattered on the inside of the cheek, the roof of the mouth and the throat.