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Worksheet for Chapter 17 (adapted from Jenkins et al., A&P from Science to Life)  
Taste and smell are chemical senses. Stimulations arise from interaction of molecules with smell and taste receptors. Impulses for smell and taste also propagate to the limbic system which is why certain odors and tastes evoke emotional responses.

Within the connective tissue, **olfactory glands** support the olfactory epithelium by secreting mucus which helps to **dissolve** inhaled chemicals called odors. Olfactory receptor cells are classified as **bipolar neurons** (one axon and one dendrite). The dendrites project to the olfactory epithelium. **Olfactory hairs**, non motile cilia that project from the dendrite, is the part of the **olfactory receptor cell** that responds to odors. Stimulation of an odorant molecule on the olfactory receptor cell causes a **generator potential**, which is a type of graded potential. Olfaction, like all the special senses has a low **threshold**.

Like olfaction, in order for molecules to be tasted they must be **dissolved**. Taste or gustation is much more simple than olfaction in that only **five primary tastes** can be distinguished (compared to our ability to recognize over 10,000 different odors). The receptors for sensations of taste are located in the **taste buds**. Located mainly on the tongue, taste buds are found in elevations called **papillae**. Three types of papillae contain taste buds: 1) **circumvallate papillae**, 2) **fungiform papillae**, and 3) **foliate papillae**. **Filiform papillae** contain **tactile receptors**, but no taste buds. They increase **friction** between the tongue and food making it easier to move food in the oral cavity. Each taste bud consists of three kinds of cells: 1) **supporting cells**, 2) **gustatory receptor cells**, and 3) **basal cells**.

When a tastant is dissolved in saliva, it can make contact with the **gustatory hair** on the gustatory receptor cell. The result is a **receptor potential**, another type of graded potential, which causes release of **neurotransmitter** from the gustatory receptor cell. The **threshold** for taste varies for each of the primary tastes. For example, **bitter** substances have the lowest threshold.

More than half of the sensory receptors in the human body are located in the eyes and a large part of the cerebral cortex is devoted to processing visual information. There are three major types of retinal neurons: 1) **photoreceptors**, 2) **bipolar cells**, and 3) **ganglion cells**. Light rays are converted to nerve impulses by two types of photoreceptors: **rods** and **cones**. From photoreceptors, visual information flows to **bipolar cells** and then to ganglion cells. The axons of the ganglion cells exit the eyeball as the **optic nerve**. These axons will terminate in the **primary visual cortex** in the occipital lobe. In the outer segments of the photoreceptors, membrane proteins called **photopigments** transduce light into receptor potentials. Photopigments are made up of protein, opsin the type of opsin differs among rods and the different types of cones, and a derivative of vitamin A, **retinal**. The photopigment for rods is **rhodopsin**. There are three different cone photopigments which absorb different wavelengths (colors) of light. When retinal absorbs light it changes shape. This change initiates chemical changes in the photoreceptor that leads to the production of a receptor potential in **bipolar cells** which can result in the generation of an **action potential** in ganglion cells.

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