Worksheet for Chapter 17 (adapted from Jenkins et al., A&P from Science to Life)
Taste and smell are **chemical** senses. Sensations 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 odorants. 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 odorants. 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.