Recitation 11 Worksheet

1. How does sensory coding in the gustatory system differ from the olfactory system – when a stimulus is presented, how do the receptor cells encode it, by signaling across a population of cells, or via only one cell type? Explain your answer.

2. For which of the following sensory systems do the receptors also fire action potentials:
   a. visual
   b. auditory
   c. olfactory
   d. gustatory
   e. somatosensory

3. Which of the following pairs of sensory systems and the nucleus of the thalamus that they project to are correct?
   a. Auditory – lateral geniculate nucleus
   b. Visual – medial geniculate nucleus
   c. Olfactory – ventral posterior medial nucleus
   d. Gustatory – none
   e. Somatosensory – ventral posterior nucleus

Answers:

1. The gustatory system uses a labeled line model whereby each taste cell detects only one type of taste – for example, sweet is detected by taste cells that respond only to sweet, and each sweet taste cell is innervated only by neurons that carry sweet information. The olfactory system, however, uses population based coding where one olfactory neurons expresses only one kind of receptor, but each receptor binds multiple odorants from the same family, and each odorant activates many receptor types. Since all neurons with the same receptor converge on the same glomerulus, a smell is coded by activation across different combinations of glomeruli.

2. C, D, E.

3. E only, here are the correct pairs:
   a. Visual – lateral geniculate nucleus
   b. Auditory – medial geniculate nucleus
   c. Olfactory – none
   d. Gustatory – ventral posterior medial nucleus
   e. Somatosensory – ventral posterior nucleus

	Location in skin	Type of stimulus detected	Speed of adaptation	Size of receptive field	1 DRG neuron innervates how many receptors
Meissner's corpuscle	Boundary btwn dermis and epidermis	motion/vibration on skin (30-50Hz)	Fast	Small	10-20
Pacinian corpuscle	Deep	motion/vibration on skin (300-500Hz)	Fast	Large	1
Ruffini corpuscles	deep	P, deformation, stretch of skin	Slow	Large	1
Merkel's disk	Surface	P, deformation, stretch of skin – fine details	slow	small	

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