# Sensory System Practice Problems:

**1.** Some insects detect sound using a Johnston's organ located at the base of their antennae. Consider the similarities and differences in the Johnson's organ and the mammalian ear. Is the sensory neuron of a scolopidia more similar in function to an inner hair cell or an outer hair cell of the mammalian organ of Corti? Explain.

**2**. A human brain receives an incoming sensory signal that it interprets as a blue light.
What features of this signal allow the brain to decide that this signal represents light (how did this signal encode stimulus modality)?
What features of this signal allow the brain to decide that the light is blue (how did this signal encode stimulus intensity)?

**3.** When you have an ear infection, fluid sometimes builds up in your middle ear, resulting in decreased hearing. Why might this be so?

**4.** Destruction of the tip links on the stereocilia of hair cells in the inner ear results in hearing loss. Explain why.

**5.** Typically, the human retina has four types of photopigment. Deuteranomaly is a condition in humans caused by a loss of function mutation in the gene for one type of photopigment. Individuals with this condition are unable to distinguish between certain colours, such as green and red. (Deuteranomaly is the most common form of "red-green colour blindness".)

a) In which type of photoreceptor (rod or cone) would you expect to find this non-functional photopigment? Explain why you would **not** expect to find this non-functional photopigment in the other type of photoreceptor. (2 marks)

b) Why would having one type of non-functional photopigment cause someone to be unable to distinguish between certain colours? Explain. (4 marks)

**6.** You are studying two identical rhabdomeric photoreceptors, X and Y, and measure the amount of neurotransmitter released by each photoreceptor at rest. You treat only Y with 3-nitrocoumarin, a molecule that completely inhibits Phospholipase C. Then you expose each photoreceptor to an identical light stimulus (of maximal intensity) and measure the amount of neurotransmitter released while the photoreceptors are exposed to this stimulus.

a) When exposed to light, will X and Y both release neurotransmitter? Explain why or why not.

b) How would this compare to the amount of neurotransmitter released by a ciliary photoreceptor at rest and during exposure to light?
(2 marks)

***Make sure to also try the "Possible exam wording" practice problems posted with the clicker questions.***