1. In the *Drosophila* eye development model mentioned in class, what phenotype do you expect to see in the following genetic manipulation experiments, and why?

   a) *Sevenless* mutation

   b) Specifically knockout *sevenless* gene in R3 and R4 cells.

   c) Delete the signal sequence in Boss, which carries the “zip code” information for cytoplasmic membrane localization.

   d) Over expression of Boss on all the membrane surface of R8

2. You find a mutant fly which cannot taste sense vibrations on one side of its body, where a sensory receptor is located. You then find that there is a deletion in a gene mapped to drosophila chromosome X. What experiments can you do to determine whether the target of the mutation is a sensory receptor?

3. You are studying the sevenless pathway in the *Drosophila* eye.

   a) If Raf is knocked out, how could you recover function in this pathway?

   b) Sevenless is expressed on R1, R3, R4, R6 and R7, but only one of these receptors is actually activated, how come?

4. Refer to the Sensory Organ Precursor cells mentioned in class.

   a) If you inject a substance that breaks down notch, what will be the fate of its two daughter cells after division?

   b) What is the fate of the sensory cells if the SOP cell is a Numb knockout?

5. In the developing frog, there are a set of neurons that send axons from the middle of the neural tube towards the ventral pole of the neural tube. You want to test if these axons are being repelled by the dorsal-most region, or if they are being attracted by the ventral-most region of the tube. Propose a simple experiment to answer your question.

6. How does the growing axon sense and interact with the environment? What happens when this structure binds to a ligand?

7. Draw the different connections between the tectum and retina. (ie. Anterior, Posterior)
8. Why is the study of dendritic spines so important?

9. Name a couple of things that we learned about dendritic spines or filopodia based on the figures shown in class.

10. What is an alternative to studying neurons in vivo (studies in which the neurons are studied in the host animal itself?) Why can this method be used? What are the advantages of it?

11. Look at the figure from lecture entitled “CA3 –CA1 synapses (P10-P60). What is shown by this figure? Briefly Explain the methods used.

12. What is SynCAM? Where does it localize?

13. Imagine you have a protease that selectively cleaves Neuroligin. What are the effects on presynaptic differentiation of a synapse when you add this protease to the presynaptic terminal?