

You are interested in eye development in *Drosophila*.

- 1) Describe an experiment to identify mutants that fail to develop properly functioning eyes in *Drosophila*
- 2) You identified several individuals that do not develop eyes. How would you go about characterizing the types of mutants you have identified?
- 3) How would you determine how many genes you have identified to be involved in eye development?
- 4) You identified 7 genes and want to define what chromosomes they are on - how would you go about doing this?
- 5) You determine that four of your genes are on chromosome 2 and three of your genes are on chromosome 3. How would you go about determining the relative distance each gene is to the other?
- 6) Your PI now wants you to do a bit more characterization of eye development. You are able to classify your mutants into three categories -
 - 1) Can't see blue light (m1, m2)
 - 2) Can't see red light (m3 — m5)
 - 3) Can't see green light (m6, m7)

How did you go about conducting this experiment?

- 7) Now you want to order the genes in a developmental pathway. Describe the set of experiments you will have to perform to determine the order of gene action.

m1 -> m2 -> m6 -> m7 -> m3 -> m5 -> normal eye function
m4 -> m5 -> normal eye function

In addition, fill in the experimental results given the above pathway. If you do not think this is possible, explain why, describe what is possible (while keeping the general pathway consistent), and describe the experimental results that lead to your altered pathway.

- 8) You want to define the null phenotype for each of the mutations. How would you go about doing this?
- 9) You become most interested in the gene (g1) that contains m1 because it is at the start of the pathway. What tools or reagents would you need in order to figure when and where g1 is expressed? Are there additional reagents you might need to determine when g1 is required to promote normal eye function?
- 10) With the tools you described above in hand, describe the experiments you will perform to determine when and where g1 is expressed and when and where it is functioning.
- 11) You are not convinced that the entire fate of a fly's eye depends on g1. What experiments can be done to identify potential modifiers of g1 function?

- 12) You identified a four modifiers of g1 function - you're on a roll! Here is what you identified:
- a) an intragenic suppressor (dominant)
 - b) an informational suppressor
 - c) an enhancer
 - d) extragenic bypass suppressor

Please describe the experiments you performed to classify each of these modifiers.