

Questions 1-4 pertain Konopka and Benzer, questions 5-8 to the lecture.

1) Can you think of the likely reason that led the authors to devise a screen enabling them to identify mutants only on the X chromosome (thus missing ~95% of the genome)?

2) The authors found 3 rhythm mutants out of ~2000 F1 males (p. 2112). Given this, would you find it worthwhile to screen a larger number of animals using this strategy?

3) On p. 2113, the authors explain how they performed complementation analyses between the three rhythm mutants, which allowed them to establish that they affect the same gene (later baptized "*per*").

a) Draw the cross corresponding to one such complementation analysis.

b) Explain why the presence of Bar on the FM 7 chromosome is useful for this analysis.

c) Would complementation analysis have been possible without it?

4) *per* encodes a transcription factor. Given this, propose a molecular mechanism underlying the semi-dominance of the *per^s* mutant allele.

5) Working with *Drosophila*, you notice a male fly with very small eyes and name the corresponding gene *tiny eyes*, and the mutant allele *tiny eyes¹*. You cross this male with a wild-type female, and find that all of the F1 progeny are wild-type. Assuming that *tiny eyes¹* is a single point mutation:

a) Is the *tiny eyes¹* mutation recessive or dominant?

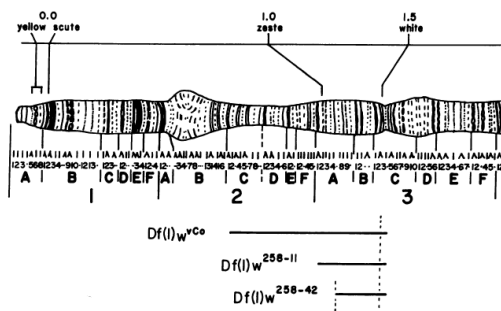
b) What do you conclude regarding the chromosomal location of the *tiny eyes* gene?

6) Next, you cross brothers and sisters from the F1 generation of the above cross and analyze flies at the F2 generation. What fraction of females and what fraction of males do you expect to exhibit the very small eye phenotype?

7) Below is the same chromosome segment to which the *per* gene maps (see p. 2115 in Konopka and Benzer).

a) You generate females of genotype *tiny eyes¹/Df(I)w²⁵⁸⁻⁴²* and find that they have wild-type eyes. What do you conclude?

b) Next, you try to generate flies of genotype *tiny eyes¹/Df(I)w²⁵⁸⁻¹¹* and find that this genotype is absent from the population. What do you conclude?



8) A fellow Masters student in the lab tells you that the above information (questions 5-7) suggests that *tiny eyes* encodes a miRNA. Do you agree?