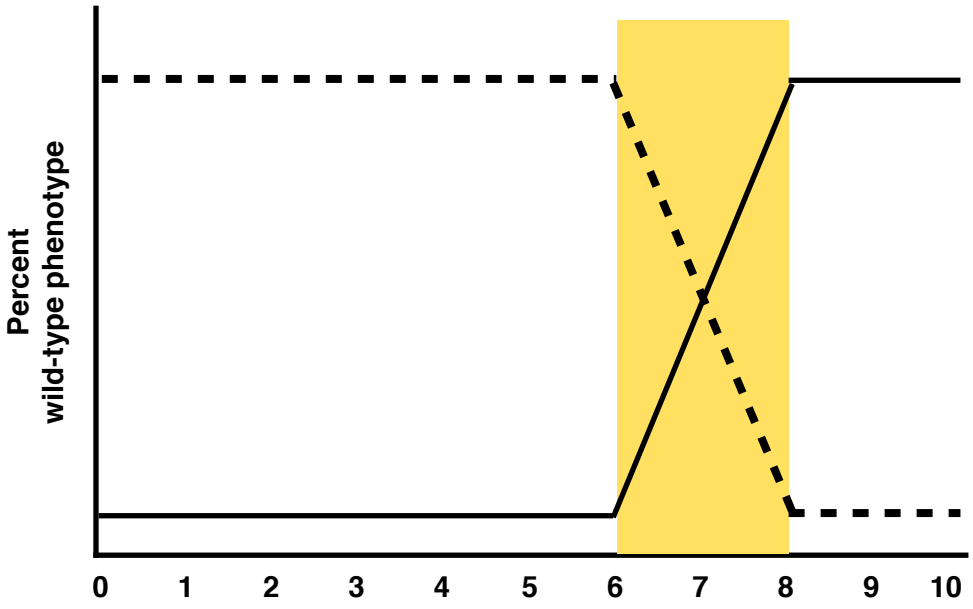
**Bio393: Genetic Analysis** **Name:**_____
**Quiz #2 - Friday May 6, 2016**

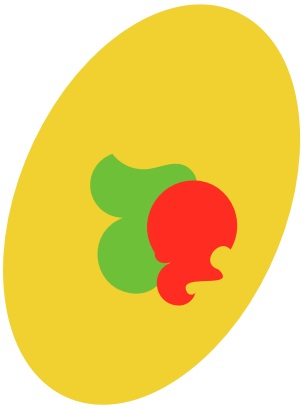
**Question 1 (4 pts):**
Draw a cross to differentiate between maternal-effect inheritance and cytoplasmic inheritance? Hint: think about multiple generations.

*With traits that show cytoplasmic inheritance, every offspring from an affected mother will be affected. The trait will be passed in each generation from mother to child.*

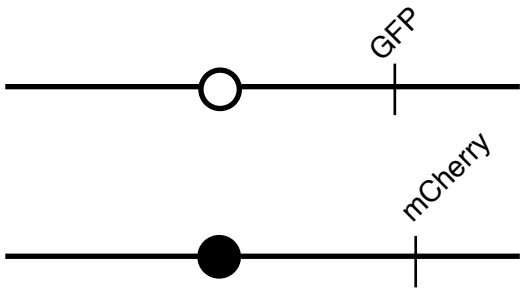
*With traits that show maternal-effect inheritance, the offspring's phenotype is dependent on the maternal genotype. Some mothers might not have the alleles that confer the dominant or recessive mutant phenotype so the offspring will be unaffected.*

**Question 2 (8 pts):**
Using a temperature-sensitive allele, you perform upshift and downshift experiments over the course of ten hours with a shift every hour. After the ten hours is complete, you measure the penetrance of the mutant phenotype. You find that the temperature-sensitive period is between six and eight hours. Please draw the upshift (solid line) and downshift (dotted line) on the graph below.





**Question 3 (8 pts):**
In *Drosophila*, you can generate twin spots using cell-specific markers. In the example below, red ommatidia are homozygous for the mCherry gene, green ommatidia are homozygous for the GFP gene, and yellow ommatidia are heterozygous for mCherry and GFP. Draw out the diploid homologous chromosomes with centromeres demarcated as open and closed circles and locations of the GFP and mCherry insertions that would lead to this mitotic recombination result.




**Question 4 (5 pts):**
A developmental geneticist at the University of Toronto identified four different promoters that drive expression of any gene in different parts of an isopod. She sends you the promoter sequences for expression in carapace, legs, antennae, and the whole animal. She also helps you to make transgenic isopods. You drive expression of the *red* gene, which when mutated makes the red color phenotype, using all four promoters.

Describe the experiment (strains, promoters, etc.) that will determine where the function of the red gene is required in the animal using these reagents and any mutant or wild-type strains.

*You want to rescue the red mutant phenotype so you will add expression constructs to red mutant isopods by transgenesis. If the gene functions in a particular cell type, then the red mutant phenotype will be rescued and the isopods will be gray.*

*If the red gene acts autonomously within the carapace, then you would expect that carapace promoter and whole animal promoter would drive red gene expression and rescue the red mutant phenotype. The leg and antennae promoters would not rescue the red mutant phenotype and the isopods will remain red.*