

## Study Guide: Sex Determination

1. In the slide on “degree of outcrossing” why are hermaphrodites shown as having slight (> 0%) outcrossing and dioecious plants with slightly < than 100% outcrossing?
2. The ancestral condition in angiosperm flowers is “perfect”, so explain what happens during the growth and development of some plants to give imperfect flowers.
3. What would be the difference in the % outcrossing of a pin-eyed flower type compared to a thrum-eyed type if there was no self-incompatibility?
4. Explain how male sterility and self-incompatibility can lead to the same outcome by different mechanisms, and explain how the mechanisms operate.
5. Male sterility is very useful in plant breeding – does male sterility always show uni-parental inheritance?
6. Is it possible to have perfect flowers on a maize plant?
7. Self-incompatibility will be most likely to occur when S alleles in the stigma and pollen
  - a. Are the same
  - b. Are different
8. Describe possible consequences on native grasses in central Oregon that are sexually compatible with creeping bentgrass if you develop and grow a genetically engineered creeping bentgrass that is male sterile (due to a nuclear gene) and is an obligate gametophytic apomict that forms an unreduced egg cell. Will the consequences be different if the two traits (sterility and apomixis) are the pleiotropic effects of a single gene vs. the effects of two different genes?
9. Explain how there are approximately equal numbers of male and female offspring in a dioecious species with defined sex chromosomes (e.g. XX and XY).
10. Give an example of a delicious vegetable which is often served only in the male state. Why are males preferred?
11. Based on the assigned reading (Luo et al., 2013), briefly answer the following questions.
  - a. Why is CMS of economic importance in agriculture?
  - b. What is a cause of CMS, in terms of gene copy number, and in what genome (e.g. nuclear, mitochondrial, chloroplast) do these copy number variants occur?
  - c. In principle, how do nuclear fertility restorer (Rf) genes restore fertility and in what genome do these restorer are these genes found?
  - d. Is there an advantage to CMS in natural populations?