

Study Guide: From Gene to Phenotype

1. Explain the different dominance relationships that can exist at any genetic locus (complete dominance, incomplete dominance, co-dominance, over dominance).
2. Why are co-dominant alleles at a locus more useful for genetic analyses than dominant and recessive alleles?
3. According to the required reading by Schnable and Springer on heterosis,
 - a) What is the meaning of this term and why is it of importance to agriculture and horticulture?
 - b) What molecular mechanisms are explained to account for heterosis?
4. Explain the different theories for heterosis and their relevance to breeding hybrid crops.
5. According to the dominance hypothesis for heterosis, should it be possible to develop an inbred with the same phenotype as an F1 hybrid?
6. Is heterosis as important in natural ecosystems as it is in agroecosystems?
7. Why is F1 hybrid seed more commonly grown than F2 hybrid seed?
8. Why is understanding epistasis important for breeders of pumpkins and squash? If you need more perspectives in order to answer this question, see <http://hortsci.ashspublications.org/content/40/6/1620.full.pdf>
9. What is epistasis and why might it be the rule rather than the exception?
10. Explain how the different relationships between alleles at interacting loci can lead to differences in the standard dihybrid ratio expectations for F2s and doubled haploids.
11. Why is the vernalization response in grasses a good example of epistasis?
12. According to the assigned reading by Cuesta-Marcos et al.,
 - a. What is meant by a facultative plant type, and why is this growth habit relevant for agriculture in the context of climate change?
 - b. What are isogenic lines and why were they so useful for this research?