

Botany 400 – Plant Systematics
Potential questions for Exam 3

1. Why do parasitic, carnivorous, and mycotrophic plant species arise? That is, what ecological pressures select for each of these weird plants?
2. Give an example of convergence (unrelated species evolving similar adaptations) in carnivorous plants. Give an example of divergence (related species evolving different adaptations) in carnivorous plants.
3. To what family of small flowers is the parasitic family with the largest known flowers (*Rafflesiaceae*) related (read **Davis et al. 2007 paper**)?
4. What two families are strongly mycorrhizal and photosynthetic but also have non-green mycotrophs?
5. What is the difference between holoparasites and hemiparasites? Indicate what is known about the evolution of these two conditions in light of the three families *Scrophulariaceae*, *Plantaginaceae*, and *Orobanchaceae*.
6. The Asterids (excluding the Lower Asterids) are one of the best defined groups of flowering plants. Indicate clearly (1) how they can be separated from Rosids, and (2) how the Lower Asterids differ generally from the typical Asterids.
7. Certain features within the Asterids are fairly good in defining subgroups (orders or sets of families), although most show some homoplasy. Discuss how the following features tie together orders or families: (a) inferior ovary, (b) pollen presentation, (c) opposite leaves, and (d) bilabiate flowers.
8. What is known about the developmental origin of "sympetaly" in Asterids, and how does such variation in origin fit with the two main groups of Asterids and with Asterids that lack petal fusion?
9. How has the "head" inflorescence that mimics a flower evolved convergently in Asterids? Besides the *Asteraceae*, what are some other families that have achieved this unique and successful feature?
10. If you are holding a radiate head like a sunflower, describe all the structures (bracts, florets, etc.) you will see from the outside to the inside.
11. The "primitive" monocot flower is considered to possess 3 sepals, 3 petals, 6 stamens, 3+ separate carpels with nectar and insect pollination. Give **two** examples,

one in Alismatales and one in Commelinoids, how floral reduction and loss of insect/nectar pollination is a recurrent theme in monocot evolution. Indicate **both** the type of pollination and the change in flowers/inflorescence that have accompanied the shift in pollination.

12. The ancestral aquatic monocot (now extinct of course) has been argued to have possessed leaves without blades and an inactive vascular cambium (for secondary growth). If this is correct, describe how monocots have been successful in dealing with both of these deficits.
13. What are some of the intrinsic and extrinsic features of orchids that have apparently driven their extraordinary diversification (read **Givnish et al. 2015 paper**)?
14. Compare and contrast the inflorescence structure, bracts, and florets of a typical grass like *Avena* (oats) and *Carex* (sedge).
15. Why do gene trees not always equal species trees? Give an example.
16. Vicariance and dispersalism are often considered to be the two main paradigms of historical biogeography. How do they differ and how would you use molecular phylogenetics to decide which one is operating for a specific disjunction.
17. What are three possible ways that a significant discrepancy can arise in species numbers between sister clades. Give an example of such a discrepancy based on what we have covered this semester
18. Define "Adaptive Radiation" and illustrate this phenomenon with the following examples: (a) cichlid fishes (2) Hawaiian Lobeliaceae.
19. How has molecular phylogenetics impacted the field of ecology - examples given in class lectures
20. Read the **Crisp et al. (2009) paper**, they showed that intercontinental dispersals in the Southern Hemisphere were more likely to occur between similar or different biome types?