

Final Essay Exam Botany 330 Algae

This is a take-home essay exam. Undergraduates, please answer any five questions. Graduate students will answer any six questions. (Problem sets from the textbook can be substituted for two questions, but only two. More information about this option will be provided in class.) Essays should be provided in hard-copy form, double-spaced, font size 12. Two-three pages per question will be appropriate in most cases. Collaboration in writing essays is prohibited.

Pre-grading is highly recommended. If you provide draft essays to Dr. G. at least a week before the exam is due, she will pre-grade it, providing specific recommendations for improvement if needed, within three days.

Information sources are expected to be the textbook, lecture notes, and assigned papers, but other sources are fine if they originated from a peer-reviewed source, preferably a professional journal of good repute.

1. Discuss the general structure and development of the diatom frustule, including molecular and biochemical aspects. Include material from the Vrieling et al. (2007) study of salinity effects on diatom silicification.
2. Discuss the occurrence of nitrogen-fixing cyanobacterial endosymbionts in diatom cells, referencing techniques used in the Foster and Zehr (2000) study.
3. Describe the structural, reproductive, and ecological features of the widespread brown algal genus *Fucus*. Discuss the methods used to study population structure of *Fucus*, referencing Tatarenkov et al. (2007) and Tatarenkov (2007).
4. Discuss the evolutionary importance of the red algal order Cyanidiales, including aspects of the *Cyanidoschyzon* genome sequence, and the endolithic, extremophilic cyanidophytes described by Yoon et al. (2006).
5. Describe the structure, life cycle, and cultivation of the economically important red seaweed *Porphyra*. Include a discussion of the movement mechanism displayed by the asexual spores (Ackland et al. 2007).
6. Discuss the evolutionary importance of prasinophyte green algae. What important features of *Ostreococcus* species have been revealed by genome sequencing (Derelle et al. 2006)?
7. Explain how stable isotopes used to evaluate food web interactions involving seaweeds. In particular, explain how the green seaweed *Ulva* was discovered to help feed geckos in coastal deserts of Peru (Catenazzi and Connelly 2007).
8. Discuss invasive or nuisance seaweeds, listing the most important genera. How did Provan et al. (2005) track the history of invasive *Codium*?

9. Discuss several desiccation- and irradiance-resistance adaptations of seaweeds that grow in the upper littoral zone. In particular, explain how the green alga *Prasiola* deals with high levels of UV radiation in its habitat (Holzinger et al. 2006).
10. Survey ways in which *Chlamydomonas reinhardtii* has served as a model cellular, biochemical, or genetic model system. Include a more-detailed discussion of the way in which this organism detects and responds to blue light (Huang et al. 2004), **or** what is known about H₂ production by this organism and how such information might be used in developing more sustainable sources of energy (Ghirardi et al. 2007).
11. Discuss some structural, cellular, reproductive, biochemical, and molecular features of charophycean green algae that reveal close relationship to the ancestry of the land plants. Focus on the hypothetical role of charophycean sugar uptake and utilization as a preadaptation in the origin of the matrotrophic embryo characteristic of land plants (Graham and Wilcox 2000) or the evolutionary relationships of *Mesostigma* (Kim et al. 2006).
12. Design your own question, clearing it with instructors first.