Botany 330 Take-Home Midterm Exam

These essay questions are designed to foster integrative thinking and your ability to comprehend the peer-reviewed literature. By that, we mean that each of your answers should combine material from more than one lecture topic and reflect the content of at least one very recent publication.

Each essay should include discussion of at least one of the provided publications, *as well as relevant material from lecture notes and your textbook*. You should cite the publication author(s) appropriately within the essay (e.g. Kim et al. 2006) and at the end (authors, date, title, journal name, volume, pages). However, you do not have to cite the textbook.

You are not expected to obtain additional information in order to answer these questions, but if you feel that is necessary, make sure that it has been peer-reviewed and cite it. "Peer-reviewed" means that the material has been carefully checked by reviewers who are experts in the field (such reviewers and authors are peers). Information that has not been peer-reviewed is not acceptable. Much website information has not been peer-reviewed, so check with us before including it. *Collaboration in your writing of answers is specifically prohibited.*

Undergrads should answer any 5 of the questions listed below, and grad students answer any 6. You should start working on this exam as soon as possible. It is not advisable to wait until close to the due date (3:30 pm Tuesday, October 28) to start writing answers, because you will need that time to study for the lab exam.

Because this is a Comm. B course for undergraduates, drafts are expected for pre-grading, which is required to receive full points on the two take-home exams and the project report. It is fine to turn in draft essays one at a time, and we recommend that you submit them well ahead of the due date. Pre-draft outlines and multiple drafts are encouraged and will be expeditiously edited. First drafts of the midterm must be received at the latest by 5 pm Friday, Oct 17. Drafts will be returned by Thursday, Oct. 23, which will allow more than a weekend for revisions. Graduate students are not required to submit drafts, but we recommend that you do so.

Drafts and final answers should be double-spaced with 12-point type, but legible handwritten drafts or answers are acceptable. Please turn in hard copy rather than sending electronic files, because the university's email filter might put them in the trash. Printing on both sides of the paper is fine for the final version, but drafts should use only one side so that editorial marks don't bleed through. Most answers should be two-three pages in length. Please compose complete sentences and coherent paragraphs, and check spelling. Write generic and species names in proper scientific form (italicized or underlined; first letter of generic name capitalized). Please also consult the editing document on the class website before starting to write.

1. Manure pollution of natural waters is a big problem in Wisconsin and other places. Briefly discuss the mineral nutrient requirements of algae and how pollution of various types affects their populations. Then discuss in more detail the Kebede-Westhead et al. 2003 paper on the use of periphyton algal turf scrubber systems to remove nutrients from effluents before their discharge to natural waters.

2. Briefly describe the types of algal structures that survive microbial degradation and leave remains in the sediments of aquatic systems. Then discuss the Harris et al. 2006 in more detail as an example of how such sedimentary remains can be used to infer past environmental conditions in studies of global change.

3. Provide a brief overview of the roles of algae in food webs. Then use the Catenazzi and Donnelly 2007 paper (and the text) to describe how stable isotopes are used to understand feeding associations in nature and the transfer of carbon from the aquatic system to the terrestrial environment.

4. Toxin-producing cyanobacteria affect human health and that of other organisms. Provide a brief description of the major types of cyanobacterial toxins, how these toxins are detected in water samples, and their health effects on humans, including a fair amount of information from the Cox et al. (2005) paper on BMAA.

5. Briefly describe the factors that foster cyanobacterial blooms. Then use the Wiedner et al. 2007 paper to illustrate the impact of temperature on a bloom forming cyanobacterial species and generalize to global warming scenarios.

6. Algae are of increasing interest as sources of renewable energy. Briefly describe three ways in which algae could be used in this way. Then use the review article by Hu et al. 2008 and your text to discuss the opportunities and challenges involved in growth microalgae for oil production.

7. Discuss the controversy surrounding the evolutionary origin of primary and secondary plastids, including information from text and the Kim and Graham 2008 paper. It is fine to take a position and defend it, but if you do, you should also include the best arguments on the other side of the issue.

8. Algae are involved in a wide variety of symbiotic associations. Briefly define symbiosis and its major forms, then briefly provide at least 5 examples of mutualistic relationships between algae and other organisms. Use the Usher 2008 review article to summarize what is known about algae-sponge associations (which count as one of the 5) in more detail.

9. Catastrophic loss of biodiversity is a major concern associated with coral bleaching. Describe the bleaching phenomenon and use the Goulet 2006 article to discuss coral-dinoflagellate associations in more detail.

10. Many protists produce survival stages known as cysts. Briefly describe the types of cysts produced by euglenoids, dinoflagellates and chrysophytes. Then use the text and the Wang et al. 2007 paper to discuss the role of cysts in dinoflagellate blooms.