OCN621: Biological Oceanography, Spring 2006
Bioenergetics Study Questions

(1) Summarize the major structures of prokaryotic and eukaryotic cells. How are they similar? How are they different?

(2) How does photosynthesis drive energy and biogeochemical cycles in the oceans?

(3) Summarize the overall photosynthetic reaction. Why do cells photosynthesize? What are the "light reactions", what do they consume and what do they produce? What components are involved? What are the "dark reactions"? What do they consume and what do they produce? What is the major enzyme involved? How are the light and dark reactions related?

(4) Oxygenic photosynthesis dominates in the open ocean. What other types of photosynthesis is present and where might it be present in the ocean?

(5) How does chemosynthesis differ from photosynthesis?

(6) What are the major types of chemotrophy and give a sample reaction for each?

(7) Define autotrophic, heterotrophic, mixotrophic and auxotrophic.

(8) Define glycolysis and respiration. How are they similar? How are they different? How are they related? What are their reactants and products?

(9) Based on the efficiency of energy extraction for aerobic and anaerobic metabolisms, how are the behavior and ecology of these metabolisms different?

(10) Many different forms of organic oxidation can exist in a water or sediment column. How is this possible?

(11) Photosynthesis and Chemosynthesis produce sugars (glucose). Why is ATP considered the "medium of exchange" for energy in all cells? What are some examples of the functions that ATP serves?

(12) Describe different methodologies for measuring standing stocks. What are the advantages and disadvantages of each?

(13) Why is carbon often used as the universal currency of biomass in biological oceanography? What are some problems with converting between different biomass measurements and carbon?

(14) Describe different methodologies for measuring rates.

(15) Why is ATP or carbon not equivalent to cellular energy content?

(16) What is the Redfield ratio and what does it describe? Why is it important for biological oceanography?

(17) Describe some short and long-term implications of bioenergetic processes not being 100% efficient. Give examples.