Aquatic Environmental Science
#09. Primary Production

Exercise (Model Answer)

Q1. What are the main reasons for dinoflagellate and cyanobacteria to be dominant in tropical water body? 2pt each

Dinoflagellate: It's because they can swim very well so that they can stay at surface layer during day time to gain sunlight and move to nutrient rich deeper layer during night for nutrient uptake.
Cyanobacteria: It's because they can fix nitrogen from the air in the nutrient poor surface layer.

Q2. The ratio of net annual production to biomass is known as 14.1, 16.0, and 0.06 in marine, freshwater, and terrestrial systems. Based on such data, describe major difference in food chain between aquatic and terrestrial systems. 2pt

The major difference is whether the retention of biomass generated via primary production is short or not. In case of aquatic systems, the stock as primary producers is relatively small compared to the terrestrial system, which is caused by their high utilization efficiency of carbon, their short life time and/or high feeding pressure.

植物プランクトンが有機物生産の担い手である海と陸水の P/B 比は，陸地に比べ著しく高い値を示します．これは，陸上植物に比べ植物プランクトンは炭素利用効率が高く、より速く摂食されたり自己分解により溶存有機物化することを意味します．海や陸水という生活空間では，光合成によって生産された有機物の回転率が陸地に比べ極めて高い生態系であると言えます．陸上での一次生産ではセルロースやリグニンなど難分解性の物質が生産されるが，水域ではこのような木質組織が少ない．

Q3. Estimate phytoplankton biomass (wet mass) which is equivalent in carbon to the amount of carbon dioxide that you emit through breathing for 24 hours. Assume that your daily carbon dioxide emission is 0.6 kg, and the contents of water and carbon in phytoplankton biomass are 98% and 1%. 2pt

Carbon emission: 0.6 kg/day = 0.6 × 12/44 × 1000 = 163.6 gC/day
Equivalent biomass: 163.6 gC/day × 100/1 × 1 day = 16.4 kg

Q4. Write one question related to today's lecture. 2pt
Any question is acceptable as long as it's related to the content of the class.