(1) What techniques are used for measuring phytoplankton biomass? What are their advantages and disadvantages?
(2) What techniques are used for measuring phytoplankton primary production? What are their advantages and disadvantages?
(3) If after 12 hours, you measure 1000DPM of C-14 uptake, the dark sample has an activity of 50DPM, you originally added 20,000DPM, and the ambient [CO₂] concentration is 2mM, what is rate of primary production? What are the units of this measurement? Is this a net or gross primary production measurement? (What the difference?) What about if you had incubated for 10minutes? 24 hours? What’s going on here?
(4) What are some problems associated with so-called incubation techniques? Are there alternatives?
(5) Given a primary production depth profile, calculate the areal production. To what “depth” do biological oceanographers usually integrate? Why?
(6) What are the three major types of physical and chemical factors controlling pelagic primary production?
(7) How does temperature potentially influence primary production?
(8) The Michaelis-Menton curve is often used to describe nutrient limitation. What is the equation, and what are the physiological interpretations of each of its parameters? How can parameters of the M-M curve be used to infer if phytoplankton are nutrient limited? What are some typical Km values for N, P, Fe?
(9) Draw a typical P-E curve. What information does this tell about the population?
(10) What is the equation describing light in the open ocean? Why is understanding the light field important for understanding primary production?
(11) What is the difference between critical depth and compensation depth?
(12) Given a typical primary production depth curve and respiration depth curve, calculate the compensation depth of the water column.
(13) Draw a typical chlorophyll profile. What factors are influencing the shape of this curve? How does this curve compare to other measures of phytoplankton biomass (carbon, cell number, fluorescence)
(14) Draw a typical primary production profile. What factors are influencing the shape of this curve? How does this curve compare to the chlorophyll profile?
(15) Draw a typical Pb profile. What factors influence the shape and magnitude of this curve?
(16) Describe four examples of horizontal spatial gradients in phytoplankton biomass (and production) in the oceans. What are driving each of these examples?
(17) What is the annual pattern of primary production in the North Atlantic? Station ALOHA? Southern Ocean?
(18) What are the major groups of phytoplankton in the world’s oceans? What are some distinguishing characteristics of each group?
(19) Describe three adaptations and how they benefit the phytoplankton for a given environment. Give an example of a phytoplankton with that adaptation.