

# APPENDIX E

# HOMWORK CALCULATIONS

Following is a homework exercise designed to give you practice with calculations required for Labs 10 & 12, involving experiments with two-species trophic microcosms. The homework is due at the beginning of class (see schedule of assignments). Late assignments will not be eligible for full credit, and may receive no credit, at the discretion of the lab instructor.

### Estimating algal concentration

In Lab 10 (p. 64), you will learn to use a spectrometer to estimate the density of algae cells in the stock culture. This is important for establishing consistent initial conditions in the experiment. To estimate algal density you will rely on the slope from a standard curve describing the relationship between cells per ml and absorbance at 680 nm as read by the spectrometer. Further information about the standard curve, as well as the formula described by the slope, can be found in Lab 10.

To set up your experimental treatments, you will need to dilute the stock culture of algae to achieve a target initial algal concentration in your microcosms. Use the formula  $C_1V_1 = C_2V_2$ , where C indicates concentration and V indicates volume. Multiply the desired target concentration ( $C_2$ ) by the final target volume in the microcosm ( $V_2$ ), and divide by the concentration of the stock culture ( $C_1$ ) to determine the volume of stock culture needed in your treatment.

For example, suppose you are provided with a stock solution at 230,000 cells/ml and you want 50 ml of a 10,000 cells/ml culture for your experiment. The calculations would be:

$$[(10,000 \text{ cells/ml}) \cdot (50 \text{ ml})] / (230,000 \text{ cells/ml}) = 2.17 \text{ ml}$$

$$50 \text{ ml} - 2.17 \text{ ml} = 47.83 \text{ ml}$$

Thus, you would need to add 2.17 ml of the stock culture to 47.83 ml of artificial sea water to establish your experimental treatment.

### Practice calculations (show all your work including units)

1. You are provided with a stock culture of *Platymonas* algae, and your lab partner records the absorbance as 0.23 at 680 nm. Estimate the number of cells per ml based on the standard curve in lab.
2. You are given a stock culture of algae and you estimate its concentration at 456,300 cells/ml. You aim to establish an initial density of 50,000 cells/ml in your experimental treatment, which will be 50 ml in final volume. How much stock culture would you need to add to achieve this concentration?

Complete the following table:

	Problem 3	Problem 4	Problem 5
Absorbance of stock culture	0.34		0.43
Concentration of stock culture (cells/ml)		535,000	
Target concentration in microcosm (cells/ml)	20,000	30,000	15,000
Target final volume of microcosm (ml)	50	50	50
ml of stock culture to add			
ml of artificial sea water to add			