Solution Making

Some general guidelines to follow when making solutions

1. Always use ultra pure water (in plastic carboys) for solutions, unless indicated otherwise.
2. Dissolve substances in a volume of water less than the final volume (.80%) needed. For example, you might start with 180 ml of water when preparing 200 ml of a solution. The solution will be brought up to the final volume after the pH is adjusted.
3. Know the pKa of the buffer being used. This is useful information when adjusting the pH; if the final pH of the solution is $1 pH unit from the pKa, then you can expect the pH of the solution to change quite rapidly as you adjust the pH. The values can be obtained from the Merck Index, Sigma Chemical Catalog, and on-line. As you adjust the pH, start with 10 M acid or base, as you approach the final pH, switch to a 1 M solution. How quickly the pH changes will depend upon the concentration of the buffer and how close the pH of the solution is to the pKa value. If you "overshoot" the final pH, you will need to start again.
4. Dissolve chemicals initially in a beaker on a magnetic stirrer. Measure final volumes with graduated cylinders; never use the gradations on beakers and flasks, since these are notoriously inaccurate. Solutions should be stored in clean reagent bottles, labeled (on tape!) with your name, name of the solution and date. Any solutions containing proteins, carbohydrates or other labile components must be refrigerated.

Molar (M) vs. millimolar (mM) vs. micromolar (µM)

I assume that students in Biol 309 have had some experience using and calculating molar concentrations. You will need to use these skills this semester. In the field of cell biology, concentrations of substances are frequently given in mM, although µM and even nM (nanomolar)
concentrations are often encountered. You need to be comfortable interchanging these units. The
basic relationships are:
1 M / 1000 mM / 106 µM / 109 nM
For example: 0.02 M / 20 mM NaCl / 2 x 104 µM = 2 x 107 nM
There are practice problems dealing with units interconversions at the end of this section.

Calculating the amount of a dry reagent substance needed for molar concentration solutions

This general equation works for chemicals to be dissolved in M or mM concentrations

grams = (gram MW of chemical)
x (volume needed in Liters)