

Learning to concentrate (for fun and profit!).

In environmental science, determining the concentration of a substance (as in a contaminate) is an important component of determining health risk, costs to remediate or likely time required for the system to “recover”. Concentration is usually expressed as a mass ratio as follows.

$$\text{Generic mass ratio} \quad \Rightarrow \quad \frac{(\text{mass of substance of interest})}{(\text{mass of entire sample})}$$

Example: 35 grams of salt dissolved into 965 grams of water.. What is the concentration of salt, describe as percent mass

$$\text{Concentration of salt} = \frac{(35 \text{ grams of salt})}{[35 \text{ grams of salt} + 965 \text{ grams of water} = 1000 \text{ grams total (of solution)]}$$

$$\text{Concentration of salt} = 35/1000 = .035 \quad (= 35 \text{ parts per thousand})$$

Lab procedure.

1. Place 10 drops of blue dye (just squeeze it out) into a Dixie-cup. Use a small, plastic pipette to suck up .5 ml. (look at the graduations on the side of the pipette!) and add to 80 mL of water in 100 mL-size beaker (or larger).

Assuming that the dye has a density of 1 gram per mL, determine the % mass of dye in your solution. (show work below).

Withdraw 10 mL of this, first solution and place in a small test tube as your first reference sample.

2. Now withdraw 2 mL of solution FROM that first test tube (using the pipette again, filled to the 1 mL mark and repeating) and place in second, separate test tube. Now add eight (8) more milli-liters of fresh water to the test tube (you should have 10 mL, total)
 - a. Calculate the mass of dye in this sample (grams)
 - b. Determine the new concentration of dye. (mass ratio) in this sample.

3. Repeat the process of described in step 2, as many times as you need (possible 3 or 4 or 5 more times) until the “solution” looks like fresh water (you can’t see any dye) recording your value of dye concentration (percent mass) for each tube.

You have just created a set of “standards” for visual comparison! (take a cell-phone picture

Lavg Question: What is the “threshold” concentration (the point at which there may be dye, but you can’t see it with your eyes?

Lab challenge: Clark will bring over an “unknown sample” of dye and, you will, using your “comparison” tubes, estimate the concentration. If you are within +/- 50% of correct, I’ll give you +2 lab points E.C.