4.3 The Compositions of Solutions

Solution concentration expressed in moles / liter = Molarity, *M*.

Molarity = moles of solute / liter of solution

Ex. 1: Calculate the Molarity of a solution that contains 45.0g of HCl dissolved in 200.0 ml of solution. Ans: 6.34 M

Ex. 2: What mass of Na_2CrO_4 is needed to prepare 300.0 ml of a 0.0100 *M* solution? Ans. 4.86 g

Ex. 3: Describe the composition of a solution that contains 0.300 g of zinc acetate in 100.0 ml of solution. Ans. Zn^{2+} = 0.0188 *M* $C_2H_3O_2^-$ = 0.0376 *M*

Ex. 4: What volume of solution contains 1.00 mg of Na^+ of a 2.50×10^{-4} *M* Na_2SO_4 solution? Ans. 87.0 ml

Standard Solutions: A solution whose concentration is accurately known.

Stock solution: Solution used for preparing other solutions of lower concentration by diluting.

Dilution: $M_1V_1 = M_2V_2$ Where *M* can be expressed in other units of concentration, ex. ppm, etc.

Ex. 5: Describe how to prepare 500.0 ml of a 0.225 *M* $Na_2C_2O_4$ (sodium oxalate) solution from a 1.370 *M* stock solution. Take 82.1ml of stock solution and dilute it to 500.0 ml

Ex.6: 3.00 ml of a 0.200 *M* hydroxylamine solution is diluted to a total volume of 18.00 ml. What is the concentration of the diluted hydroxylamine solution? 0.033 *M*

ppm, ppb: parts per million (1 part of solute for every or million parts of solution or ppb as one part of solute per every billion parts of solution). Used by environmentalists for very dilute solutions. Giving that the solutions density is near 1 g/ml, then 10^3 g = 1 kg = 1 liter of solution.

ppm: g solute/ 10^6 grams of solution = mg solute / kg solution = μg solute = gram solution, etc.
ppm has a Δ of 10^6, 6 powers of 10.

ppb: g solute / 10^9 grams of solution, ng solute / gram of solution = ug solute / kg solution, etc.
ppb has a Δ of 10^9, p powers of 10.

Practice Problems: P.171 #21 c., 22, 23, 25, 27, 30, 31, 32, 33, 79, 80, 81, 96