Parts Per Million Calculations

1. 0.2500 grams of $CaCO_3$ is dissolved in HCl and enough water to give 500.0 mL of solution. What is the ppm of calcium ion ($mgCa^{2+}$/L solution) in the solution ?

$$(0.2500\text{ g } CaCO_3)\left(\frac{1 molCaCO_3}{100.09 gCaCO_3}\right)\left(\frac{1 molCa^{2+}}{1 molCaCO_3}\right)\left(\frac{40.08 gCa^{2+}}{1 molCa^{2+}}\right)\left(\frac{1000 mgCa^{2+}}{1 gCa^{2+}}\right) =$$

200.2 ppm Ca^{2+}

2. 10.0 mL of the above solution is diluted to 100.0 mL. What is the ppm of Ca^{2+} in the dilute solution ?

Use the dilution formula $C_1V_1 = C_2V_2$ where C, concentration can be in units of molarity, ppm, ppb, etc.

(200.2 ppm)(10.0 mL) = (C_2)(100.0 mL)

C_2 = 20.02 ppm Ca^{2+}

One can plot a calibration curve of Absorbance versus ppm Ca^{2+} , or other metals, and obtain the slope for the relationship between absorbance and ppm.

3. 5.00 mL of an unknown calcium solution is diluted to a volume of 20.0 mL (soln A).
   10.0mL of solution A is diluted to 50.0 mL to give soln B. Soln B has an absorbance of 0.150. Using a calibration curve of slope 0.200/ppm, what is the ppm of calcium in the unknown ?

   Beer's Law is A = (m)(ppm) Then ppm = A/m = 0.150/0.200 = 0.750 ppm for soln B.

   For soln A: (10.0 mL)(ppm) = (0.750 ppm)(50.0 mL)

   Ppm = 3.75 ppm

   For original unknown: (5.00 mL)(ppm) = (20.0 mL)(3.75 mL)

   Ppm = 15.0 ppm