Answer on Question #67786 - Chemistry – General Chemistry

Task:

What is the [Cl^-] of a solution made by dissolving 0.981 g calcium chloride (MM= 110.98 g/mol) in a final volume 500.0 mL?

Solution:

Let's find the amount of calcium chloride substance:

$$n(CaCl_2) = \frac{m(CaCl_2)}{M(CaCl_2)} = \frac{0.981g}{110.98\,{}^{g}\!/_{mol}} = 0.00884\,moles\,of\ CaCl_2$$

Let's find the molar concentration of calcium chloride

$$C_m(CaCl_2) = \frac{n(CaCl_2)}{V(solution)} = \frac{0.00884\,mol}{0.5\,L} = 0.01768\,{}^{mol}\!/_{L}$$

Let us write down the dissociation of calcium chloride in solution:

$$CaCl_2 \rightarrow Ca^{2+} + 2Cl^-$$

Then,

$$C_m(CaCl_2) = [Ca^{2+}] = \frac{[Cl^-]}{2};$$

$$[Cl^-] = C_m(CaCl_2) * 2 = 0.01768\,{}^{mol}\!/_{L} * 2 = 0.03536\,{}^{mol}\!/_{L}$$

Answer: [Cl^-] = 0.03536 mol/L.