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Ch 4: M & % vol Ans Key

AP Chemistry Practice Problem #1 Ch. 4

A stock bottle of nitric acid solution is 46% acid by weight. The density of the solution is 1.15 g/mL.

a) **Assuming a 100 gram sample, how many moles of acid do you have?**

46% → $\frac{46\text{g } HNO_3}{100\text{g solution}}$ → have $46\text{g } HNO_3 \times \frac{\text{mol}}{\text{MM g}}$ (63.02) = 0.73 mol HNO_3

b) **What is the molarity (M) of the stock solution?**

$M = \frac{0.73\text{mol}}{?\text{mL}} \rightarrow \frac{1.15\text{g soln}}{1\text{mL soln}} \times \frac{46\text{g } HNO_3}{100\text{g soln}} \times \frac{1\text{ mol } HNO_3}{63.02\text{g } HNO_3} = 0.0084\text{M}$

8.4 mM

mM = millimolar

c) **What is the molality (m) of the stock solution? Molality = mol solute/kg solvent**

$\frac{0.0084\text{ mol } HNO_3}{1\text{ mL solution}}$

$\frac{46\text{g } HNO_3}{100\text{g soln}}$ or $\frac{46\text{g } HNO_3}{54\text{g } H_2O} \times \frac{1000\text{g}}{1\text{kg}} \times \frac{\text{mol } HNO_3}{63.02\text{g } HNO_3} = 14\text{ m}$