Conversion from Molality to Molarity

Problem: Find the molarity of 21.4 m HF. This aqueous solution has a density of 1.101 g/mL.

Step 1. Make an assumption.

Assume you have 1 kg of solvent (water). This is a very important step and the amount of solution is not given but you need to have a specific quantity to do the calculations and one kilogram is the best assumption.

Step 2. Find the total mass of HF (solute).

21.4 m means 21.4 moles /kg solvent (water).
21.4 X 20.01 g/mole = 428.21 grams HF.

Step 3. Calculate the total grams of the solution.

1000 grams solvent (water) + 428.21 grams HF = 1428.21 grams solution.

Step 4. Calculate the volume (Liters) of solution.

1428.21 grams X 1mL/1.101 grams (density) = 1297.19 mL = 1.29719 L

Step 5. Calculate the molarity.

21.4 moles solute / 1.29719 L = **16.5 M HF**