Answer on Question #78389, Chemistry / General Chemistry

Question:

The density at 20 °C of a 0.669 M solution of acetic acid in water is 1.0041 g/mL. The molar mass of acetic acid, CH_3CO_2H, is 60.05 g/mol.

What is the mol fraction of the solution?

What is the mass % of the solution?

What is the molality of the solution?

Solution:

All calculations below are for 1 L of solution!

Mass of solution: $1.0041 \cdot 1000 = 1004.1$ g

Amount of acetic acid: 0.669 mol

Mass of acetic acid: $60.05 \cdot 0.669 = 40.17345$ g

Mass of water: $1004.1 - 40.17345 = 963.92655$ g (= 0.96392655 kg)

Amount of water: $963.92655 / 18.02 = 53.492$ mol

So:

Molar fraction: $0.669 / (0.669 + 53.492) =$ **0.01235 = 1.235 mol%**

Mass fraction: $40.17345 / 1004.1 =$ **0.04 = 4 wt%**

Molality: $0.669 / 0.96392655 =$ **0.694 mol/kg**

Answer:

Molar fraction: 0.01235 = 1.235 mol%

Mass fraction: 0.04 = 4 wt%

Molality: 0.694 mol/kg