Answer on the question #67093, Chemistry / General Chemistry

Question:

Determine the percent mass of a 0.750 Molarity H2SO4 solution. The solution has a density of 1.046 g/mL.

Solution:

Mass percentage can be calculated according to the following equation:

$$\omega = \frac{m(H_2SO_4)}{m(solution)}$$

Using mass and number of the moles relation for the sulfuric acid, we can write the mass as a product of number of the moles and molar mass. Also; mass of the solution and its volume are related through density. Finally, we get:

$$\omega = \frac{n(H_2SO_4) \cdot M(H_2SO_4)}{V(solution) \cdot d(solution)}$$

As far as we know, molarity of the solution is the ratio between number of the moles of the solute and volume of the solution:

$$c = \frac{n(H_2SO_4)}{V(solution)}$$

Introducing molarity in our expression for the mass percentage:

$$\omega = \frac{c \cdot M(H_2SO_4)}{d(solution)} = \frac{0.750(mol\ L^{-1}) \cdot 98.0785(g\ mol^{-1})}{1.046(g\ L^{-1}) \cdot 10^3} = 0.0703\,, or\ 7.03\%$$

Answer: Mass percentage is 7.03%.