Answer on the question #65902, Chemistry / Other

Question:

What is the Normality of a solution made by diluting 50.00 ml of H2SO4 with a specific gravity of 1.080 containing 11.60% H2SO4 by weight to one liter with water?

Solution:

Normality, or equivalent concentration, is molar concentration, divided by the factor of equivalency:

$$N = \frac{c_i}{f_{eq}}$$

As one molecule of sulfuric acid produces two hydronium ions in the solution, factor of equivalency is 0.5.

Molar concentration is:

$$c_{acid} = \frac{n(acid)}{V(solution)} = \frac{m_{acid}}{M_{acid}V_{sol.}}$$

Volume of the solution $V_{sol.}$ is 1L, molar mass is 98,0785 g/mol. The mass of acid added is (taking the density of water as 1 g/ml, the density of stock solution is 1.080 g/ml):

$$m_{acid} = m_{stock\,sol.}\omega_{stock\,sol.} = V_{stock\,sol.}d_{stock\,sol.}\omega_{stock\,sol.}$$

$$m_{acid} = 50.0\,(ml) \cdot 1.080(g\,ml^{-1}) \cdot 0.1160 = \ 6.264\,g$$

$$c_{acid} = \frac{6.264\,(g)}{98.0785\,(g\,mol^{-1}) \cdot 1(L)} = 0.06387\,mol\,L^{-1}$$

$$N = \frac{c}{f} = \frac{0.06387\,mol\,L^{-1}}{0.5} = \ 0.1277\,eq\,L^{-1}$$

Answer: 0.1277 eq/L