Answer on the question #62367, Chemistry / Physical Chemistry

Question:

What is the total volume of the solution, when 3.80 mol of water is mixed with 0.500 mol of ethanol? The partial molar volumes of water and ethanol at this composition are 1.80 x105 m3 mol-1 and 5.34 × 10-5 m3 mol-1, respectively

Solution:

The total volume is the sum of the products of molar volumes and number of the moles over the components:

$$V = \sum_i n_i V_i.$$

As we have only ethanol and water:

$$V = n_{water}V_{water} + n_{EtOH}V_{EtOH}$$

$$V = 3.80 \cdot 1.80 \cdot 10^{-5}\left(\frac{mol \cdot m^3}{mol}\right) + 0.500 \cdot 5.34 \cdot 10^{-5}\left(\frac{mol \cdot m^3}{mol}\right) = 9.51 \cdot 10^{-5} m^3$$

Answer: $9.51 \cdot 10^{-5} m^3$