

Answer on Question#50749 – Chemistry – Physical Chemistry

In a solution 0.200 kg each of water and ethanol are present. Calculate the mole fraction of each component.

Solution:

$$x_i = \frac{v_i}{v_{\text{tot}}}; \quad x_i - \text{the mole fraction}; \quad v_{\text{tot}} - \text{the total amount of all constituents in a mixture (mol)};$$

$$v = \frac{m}{M}; \quad v - \text{the mole (mol)}; \quad m - \text{the mass (g)}; \quad M - \text{the molar mass (g/mol)};$$

$$M(\text{H}_2\text{O}) = 18 \text{ g/mol}; \quad m(\text{H}_2\text{O}) = 200 \text{ g};$$

$$v(\text{H}_2\text{O}) = 11.11 \text{ mol};$$

$$M(\text{C}_2\text{H}_5\text{OH}) = 46 \text{ g/mol}; \quad m(\text{C}_2\text{H}_5\text{OH}) = 200 \text{ g};$$

$$v(\text{C}_2\text{H}_5\text{OH}) = 4.35 \text{ mol};$$

$$v_{\text{tot}} = v(\text{H}_2\text{O}) + v(\text{C}_2\text{H}_5\text{OH}); \quad v_{\text{tot}} = 15.46 \text{ mol};$$

$$X_{(\text{H}_2\text{O})} = 0.72$$

$$X_{(\text{C}_2\text{H}_5\text{OH})} = 0.28$$

Answer: $X(\text{H}_2\text{O})=0.72$

$$X(\text{C}_2\text{H}_5\text{OH})=0.28$$