

Answer on Question #41800 - Chemistry – Inorganic Chemistry

Question

What is the molality of semimolar NaCl soln if density is 1.16gcm⁻³

Answer:

Semimolar NaCl solution means that molar concentration of this solution is 0.5 M, therefore 1 L of this solution contains 0.5 mol of NaCl.

The mass of 1 L of this solution equals:

$$m(\text{solution}) = V \cdot \rho = 1000 \cdot 1.16 = 1160 \text{ g}$$

V – The volume of the semimolar NaCl solution, V = 1 L = 1000 mL.

ρ – The density of this solution, $\rho = 1.16 \text{ g/mol}$.

The mass of 0.5 mol of NaCl equals:

$$m(\text{NaCl}) = n \cdot M = 0.5 \cdot 58.5 = 29.3 \text{ g}$$

n – Number of moles of NaCl, n = 0.5 g.

M – Molar mass of NaCl, M = 58.5 g/mol.

The mass of water in this solution equals:

$$m(\text{water}) = m(\text{solution}) - m(\text{NaCl}) = 1160 \text{ g} - 29.3 \text{ g} = 1130.7 \text{ g}$$

So the molality of semimolar NaCl solution is:

$$C_m = \frac{n(\text{NaCl})}{m(\text{water})} = \frac{0.5}{1.1307} = 0.44 \text{ mol/kg}$$

Answer: 0.44 mol/kg.