

## Answer on Question #57511 – Chemistry – General chemistry

### Question:

Question: An aqueous solution containing 18.2 wt% KI has a density of 1.152 g/mL. Find the molarity (M) and molality (m) of the solution.

### Solution:

For convenience denote molarity as  $b$  and molality as  $c$ .

$$1) \quad b = \frac{n_{KI}}{m_{solvent}}$$

$$w_{KI} = \frac{m_{KI}}{m_{solution}} \Leftrightarrow m_{KI} = w_{KI} \cdot m_{solution}$$

$$n_{KI} = \frac{m_{KI}}{M_{KI}} = \frac{w_{KI} \cdot m_{solution}}{M_{KI}}$$

$$m_{solvent} = (1 - w) \cdot m_{solution}$$

$$b = \frac{w_{KI} \cdot m_{solution}}{M_{KI} \cdot (1 - w_{KI}) \cdot m_{solution}} = \frac{w_{KI}}{M_{KI} \cdot (1 - w_{KI})}$$

$$w_{KI} = 18.2\% = 0.182$$

$$M_{KI} = 166 \text{ g/mol}$$

$$b = \frac{0.182}{166 \text{ g/mol} \cdot (1 - 0.182)} = \frac{0.182 \text{ mol}}{135.788 \text{ g}} = 0.00134 \frac{\text{mol}}{\text{g}} = 1.34 \text{ mol/kg}_{solvent}$$

$$2) \quad c = \frac{n_{KI}}{V_{solution}}$$

$$\rho_{solution} = \frac{m_{solution}}{V_{solution}} \Leftrightarrow V_{solution} = \frac{m_{solution}}{\rho_{solution}}$$

$$c = \frac{w_{KI} \cdot m_{solution} \cdot \rho_{solution}}{M_{KI} \cdot m_{solution}} = \frac{w_{KI} \cdot \rho_{solution}}{M_{KI}}$$

$$\rho_{solution} = 1.152 \frac{\text{g}}{\text{mL}} = 1152 \text{ g/L}$$

$$c = \frac{0.182 \cdot 1152 \text{ g/L}}{166 \text{ g/mol}} = 1.263 \text{ mol/L}$$

### Answer:

$$\text{molality} = 1.34 \text{ mol/kg}_{solvent}$$

$$\text{molarity} = 1.263 \text{ mol/L}$$