

Solutions - 3 - Molality $\frac{\text{mol solute}}{\text{kg solvent}}$.

- 1) Calculate the molality of 225mg glucose ($\text{C}_6\text{H}_{12}\text{O}_6$, MW = 180.2 g/mol) in 5.00 mL Ethanol ($d = 0.789 \text{ g/mL}$).

$$\text{mol} = \frac{\text{mol solute}}{\text{kg solvent}}$$

$$\text{mol glucose} = 225 \text{ mg} \times \frac{1 \text{ g}}{1000 \text{ mg}} \times \frac{1 \text{ mol}}{180.2 \text{ g}} = 0.001249 \text{ mol}$$

$$\text{kg ethanol} = 5.00 \text{ mL} \times \frac{0.789 \text{ g}}{1 \text{ mL}} \times \frac{1 \text{ kg}}{1000 \text{ g}} = 0.003945 \text{ kg}$$

$$\text{mol} = \frac{0.001249 \text{ mol}}{0.003945 \text{ kg}} = \boxed{0.317 \text{ m}}$$

- 2) How many grams of benzoic acid ($\text{C}_6\text{H}_5\text{COOH}$, MW = 122.1 g/mol) must be dissolved in 50.0 mL of benzene (C_6H_6 , $d = 0.879 \text{ g/mL}$) to produce a 0.150 m benzoic acid solution?

$$\text{mol} = \frac{\text{mol sol}}{\text{kg solvent}} \quad \text{mol solute} = \text{mol} \times \text{kg solvent}$$

$$\text{kg solvent} = 50.0 \text{ mL benz.} \times \frac{0.879 \text{ g}}{1 \text{ mL}} \times \frac{1 \text{ kg}}{1000 \text{ g}} = 0.04395 \text{ kg}$$

$$\text{mol solute} = \frac{0.150 \text{ mol benz. A}}{1 \text{ kg solv}} \times 0.04395 \text{ kg solv} \times \frac{122.1 \text{ g}}{1 \text{ mol}}$$

g solute

$$= \boxed{0.805 \text{ g benz. acid}}$$