

c) Ex 3: Antifreeze soln. is 23.9% (wt%) ethylene glycol ( $C_2H_4(OH)_2$ ) in  $H_2O$ . The density of the soln. is 1.045 g/mL

• What are the mole fractions of the components?

• What is the molarity of soln.?

$$23.9\% = \frac{23.9 \text{ g E.G.}}{100 \text{ g soln}}$$

Assume 100 g soln.

$$\Rightarrow 23.9 \text{ g E.G.}$$

$$? \text{ g } H_2O = 100 \text{ g soln} - 23.9 \text{ g EG} = 76.1 \text{ g } H_2O$$

$$MW_{EG} = 62.08$$

$$MW_{H_2O} = 18.02$$

1) Find mole fractions

$$? \text{ mol}_{EG} = 23.9 \text{ g EG} \times \frac{1 \text{ mol}}{62.08 \text{ g}} = 0.3850 \text{ mol EG}$$

$$? \text{ mol}_{H_2O} = 76.1 \text{ g} \times \frac{1 \text{ mol}}{18.02 \text{ g}} = 4.223 \text{ mol } H_2O$$

$$\chi_{EG} = \frac{0.3850 \text{ mol}}{(0.3850 + 4.223)} = 0.0835$$

$$\chi_{H_2O} = \frac{4.223}{4.608} = 0.916$$

2) Find molarity

wt sol  $\rightarrow$  vol soln

$$? \text{ L soln} = 100 \text{ g soln} \times \frac{1 \text{ mL soln}}{1.045 \text{ g soln}} \times \frac{1 \text{ L soln}}{10^3 \text{ mL soln}}$$
$$= 0.09569 \text{ L}$$

$$? \frac{\text{mol}}{\text{L soln}} = \frac{0.3850 \text{ mol}}{0.09569 \text{ L soln}} = 4.02 \text{ M}$$