3º teste repetição. 16 Dez 2022 (1)

1. a) $x_{met} = 0.10$ $P = 145$ kPa $y_{met} = 0.48$

$P^*_{met} = 84$ kPa

$$y_{met} P = P^*_{met} x_{met} \gamma_{I,met}$$

$\gamma_{I,met} = 8.29$

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b) $\Delta G_{mistr,m} = RT \sum_i x_i \ln(x_i \gamma_{i,I})$

$\Delta G^{ideal}_{mistr,m} = RT \sum_i x_i \ln x_i$

$P^*_{hex} = 76$ kPa $y_{hex} = 0.52$ $x_{hex} = 0.90$

$P = 145$ kPa

$$y_{hex} P = P^*_{hex} x_{hex} \gamma_{I,hex}$$

$\gamma_{I,hex} = 1.10$

$\Delta G_{mistr,m} = 8.314 \times 333.15 \times (0.10 \ln(0.10 \times 8.29) + 0.90 \ln(0.90 \times 1.10)) = -77.0 \text{ J mol}^{-1}$

$\Delta G^{ideal}_{mistr,m} = 8.314 \times 333.15 \times (0.10 \ln 0.10 + 0.90 \ln 0.90) = -900 \text{ J mol}^{-1}$

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c) $\gamma_{II,met} = \dfrac{\gamma_{I,met}}{\gamma^{\infty}_{I,met}}$ (mesma composição)

$$\gamma_{II,met} = \frac{8.29}{21} = 0.39$$

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d) $P = P_{hex} + P_{met} = p^*_{hex}\, x_{hex}\, \gamma_{I,hex} + p^*_{met}\, x_{met}\, \gamma_{I,met}$

$$81.1 = p^*_{hex} \times 0.10 \times 9 + p^*_{met} \times 0.90 \times 1.0$$

$$\ln p^*_{met} = 18.1733 - \frac{4574.80}{318.15} = 3.794$$

$p^*_{met}(45°C) = 44.43$ kPa

$$p^*_{hex} = \frac{81.1 - 44.33 \times 0.90 \times 1.0}{0.10 \times 9} = 45.68 \text{ kPa}$$

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e) 45° C: $p_{met} = p^*_{met}\, \gamma^{\infty}_{I,met} =$

$= 44.43 \times 21 = 933.0$ kPa

60° C: $\gamma^{\infty}_{I,met} = ?$

$x_{met} = 0.02$ $P = 130$ kPa $y_{met} = 0.41$

$y_{met} P = p^*_{met}\, x_{met}\, \gamma_{I,met}$

$\searrow 84$ kPa

$\gamma_{I,met} = 31.7$

$x_{met} = 0.01$ $P = 120$ kPa $y_{met} = 0.35$ (3)

$p^*_{met} = 84$ kPa

$\gamma^{\infty}_{I,met} = 50$ $\gamma^{\infty}_{I,met}(60^\circ C) \approx 60$ (imprecisão)

$60^\circ C$: $k_{met} = p^*_{met}\,\gamma^{\infty}_{I,met} =$

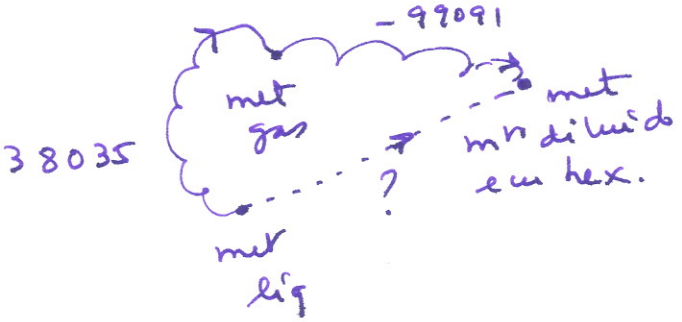
$= 84 \times 60 = 5040$ kPa

$$\ln k_2 - \ln k_1 = \frac{\Delta_{sol,met}H}{R}\left(\frac{1}{T_2} - \frac{1}{T_1}\right)$$

$$\ln 5040 - \ln 933 = \frac{\Delta_{sol,met}H}{8.314}\left(\frac{1}{333.15} - \frac{1}{318.15}\right)$$

$\Delta_{sol,met}H = -99091$ J mol^{-1} (met. gasoso)

$\Delta_{vap,met}H \approx 8.314 \times 4574.80 = 38035$ J mol^{-1}



$? = \Delta_{sol,met}H = -99091 + 38035 = -61056$ J mol^{-1}

(met. líquido)

2. a) $100\ mg = 0.1\ g$ (4)

$M(\text{sacarose}) = 342.0\ g\,mol^{-1}$

$n_{\text{sacarose}} = n_i = \frac{0.1}{342.0} = 2.9240 \times 10^{-4}\ mol$

$100\ g\ \text{d'água} = 100\ cm^3 = 0.1\ dm^3 \approx V_{sol^n}$

$\uparrow \rho$

$[i] = \frac{2.9240}{0.1} = 2.9240 \times 10^{-3}\ mol\ dm^{-3}$

$\Pi = RT[i] = 0.08314 \times 298.15 \times 2.9240 \times 10^{-3}$

$= 0.072481\ bar = 7248.1\ Pa =$

$= \rho\, g\, \Delta h = \underbrace{1000}_{kg\,m^{-3}} \times \underbrace{9.8}_{m\,s^{-1}} \times \underbrace{\Delta h}_{m}$

$\Delta h = 0.7396\ m = 74.0\ cm$

b) $\ln x_A = \frac{\Delta_{fus,A} H}{R}\left(\frac{1}{T_{fusA}} - \frac{1}{T_{fus}}\right)$

$6010\ J\,mol^{-1}$ $\qquad 273.15\ K = 0°C$

$x_A = \frac{n_A}{n_t} \qquad n_A = \frac{100\ g}{18\ g\,mol^{-1}} = 5.5556\ mol$

$x_A = \frac{5.5556}{5.5556 + 2.9240 \times 10^{-4}} =$

$= 0.99995$

$$\ln 0.99995 = \frac{6010}{8.314}\left(\frac{1}{273.15} - \frac{1}{T_{fm}}\right)$$

$T_{fm} = 273.14\ K \quad < T_{fmA}$