

相平衡参考答案

2. $S=3, R=1, R'=0, K=2, \Phi=3, f=K-\Phi+2=2-3+2=1, 0=4-\Phi, \Phi_{\max}=4.$

4. $p = 60 \times 9.8 \text{ N} \div (7.62 \times 10^{-2} \text{ m} \times 2.45 \times 10^{-5} \text{ m} \times 2) = 1.58 \times 10^8 \text{ Pa}$ (注意有两只鞋)

$$p_2 - p_1 = \frac{\Delta H_m}{\Delta V_m} \ln \frac{T_2}{T_1}$$

$$1.58 \times 10^8 - 101325 = \frac{6010}{-1.63 \times 10^{-6}} \ln \frac{T_2}{273} \quad T = 262 \text{ K}$$

7. $\ln \frac{p_2}{p_1} = -\frac{\Delta H_m}{R} \left(\frac{1}{T_2} - \frac{1}{T_1} \right), \quad 0 \rightarrow 10^\circ\text{C} \quad \ln \frac{1.228}{0.6106} = -\frac{\Delta H_m}{8.314} \left(\frac{1}{283} - \frac{1}{273} \right),$

$\Delta H_m = 44880 \text{ J/mol}$ (l → g),

$$\ln \frac{p_{20}}{1.228} = -\frac{44880}{8.314} \left(\frac{1}{293} - \frac{1}{283} \right) \quad 20^\circ\text{C} \text{ 的饱和蒸气压 } p_{20} = 2.355 \text{ kPa}$$

$\Delta H_m = 44880 + 333.5 \times 18 = 50883 \text{ J/mol}$ (s → g)

-25°C 冰的蒸气压 $\ln \frac{p_3}{0.6106} = -\frac{50883}{8.314} \left(\frac{1}{248} - \frac{1}{273} \right) \quad p_3 = 0.06372 \text{ kPa}$

相对湿度: $p_3/p_{20} \times 100\% = 2.7\%$

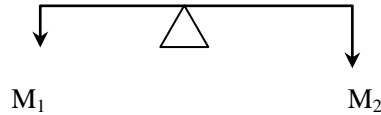
9. $M_1 + M_2 = 5$

$M_1 \times (50\% - 8.4\%) = M_2 \times (72.2\% - 50\%)$

$M_1 = 1.74 \text{ kg}, M_2 = 3.26 \text{ kg}$

M1 含苯酚: $1.74 \times 8.4\% = 0.146 \text{ kg}$

M2 含苯酚: $3.26 \times 72.2\% = 2.35 \text{ kg}$



11. 45°C A 的蒸气压: $\ln \frac{p^*}{101325} = -\frac{35000}{8.314} \left(\frac{1}{318} - \frac{1}{338} \right) \quad p^* = 46293 \text{ Pa}$

45°C B 的蒸气压 $B \quad 101325 = 46293 \times 0.2 + p_B^* \times 0.8 \quad p_B^* = 115083 \text{ Pa}$

出现第一个气泡时: $p = 46293 \times 0.4 + 115803 \times 0.6 = 87567 \text{ Pa}$

$y_A = 46293 \times 0.4 \div 87567 = 0.2115, y_B = 0.7885$

最后一个气泡时: $y_A = 0.4, y_B = 0.6,$

$$\frac{y_A}{y_B} = \frac{P_A^* x_A}{P_B^* x_B} \quad \frac{0.4}{0.6} = \frac{46293 x_A}{115083 x_B} \quad x_A = 1.65 x_B, \quad x_A = 0.62, \quad x_B = 0.38$$

$p = 46293 \times 0.62 + 115803 \times 0.38 = 72433 \text{ Pa}$

13. $M_1 + M_2 = 1$

$M_1 \times (45.5\% - 43.1\%) = M_2 \times (58.8\% - 45.5\%)$

$M_1 = 5.54 M_2,$

$M_1 = 0.153 \text{ kg}, M_2 = 0.847 \text{ kg}$

15. 6.75%相中水的摩尔分数为: $\frac{93.25/18}{93.25/18 + 6.75/88} = 0.985$

3.79%相乙酸乙酯的摩尔分数为: $\frac{96.21/88}{3.79/18 + 96.21/88} = 0.839$

含水 3.79%一相, 乙酸乙酯为溶剂, 符合 Raoult 定律, 则其蒸气压为

$$p_1 = p_1^* x_1 = 22.13 \times 0.839 = 18.56 \text{ kPa}$$

含 6.75%相中, 水为溶剂, 符合 Raoult 定律, 则其蒸气压为

$$p_2 = p_2^* x_2 = 6.4 \times 0.985 = 6.3 \text{ kPa}$$

$$p = p_1 + p_2 = 6.3 + 18.56 = 24.86 \text{ kPa}$$