OSAGAI BAKARREKO FASEEN ARTEKO ORRIA

3. ARIKETA

$P_1 = 1 atm$

$T_2 = 393K$

$T_1 = 373K$

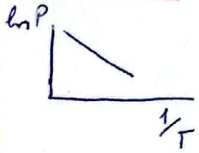
$\Delta_{vap}H^\circ_{373} = 40'7 kJ/mol$

$$\ln\frac{P_2}{P_1} = -\frac{\Delta H_{vap}}{R}\left(\frac{1}{T_2} - \frac{1}{T_1}\right)$$

$$\ln\frac{P_2}{1} = -\frac{40'7}{8'314\cdot10^{-3}}\left(\frac{1}{393} - \frac{1}{373}\right)$$

$P_2 = 1'95 atm$

4. ARIKETA



$$\ln P = 19'485 - 4579'28\cdot\frac{1}{T}$$

$$\ln 760 = 19'485 - \frac{4579'28}{T} \rightarrow T = 356'31K = 83'31°C$$

$$4579'28 = \frac{\Delta H}{8'314\cdot10^{-3}}$$

$\Delta H = 38'02 kJ/mol$

5. ARIKETA

$T_1 = 296K$

$P_1 = 197 mmHg$

$T_2 = 318K$

$P_2 = 448 mmHg$

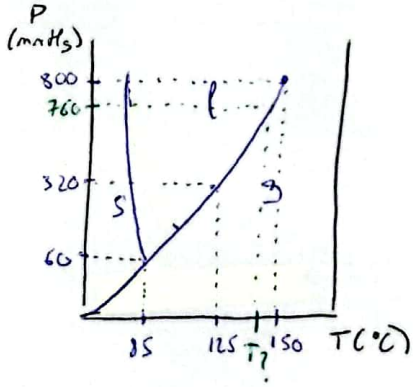
$$\ln\frac{P_2}{P_1} = -\frac{\Delta H_{vap}}{R}\left(\frac{1}{T_2} - \frac{1}{T_1}\right)$$

$$\ln\frac{448}{197} = -\frac{\Delta H_{vap}}{8'314\cdot10^{-3}}\left(\frac{1}{318} - \frac{1}{296}\right)$$

$\Delta H_{vap} = 29'3 kJ$

$$\ln\frac{760}{197} = \frac{-29'3}{8'314\cdot10^{-3}}\left(\frac{1}{T_2} - \frac{1}{296}\right) \rightarrow 1'35 = -\frac{3524'17}{T_2} + 11'9 \rightarrow T_2 = 353K = 61°C$$

7. ARIKETA



$$\ln\frac{P_2}{P_1} = -\frac{\Delta H_{vap}}{R}\left(\frac{1}{T_2} - \frac{1}{T_1}\right)$$

$$\ln\frac{800}{320} = -\frac{\Delta H_{vap}}{8'314\cdot10^{-3}}\left(\frac{1}{150} - \frac{1}{125}\right) \rightarrow \Delta H_{vap} = 57'1 kJ/mol$$

$$\ln\frac{760}{320} = \frac{-5'71}{8'314\cdot10^{-3}}\left(\frac{1}{T_2} - \frac{1}{125}\right)$$

$$0'86 = -\frac{687'21}{T_2} + 5'49 \rightarrow T_2 = 148'58°C$$

8. ARIKETA

(s) $\ln P = 24'241 - \frac{6206}{T}$

(l) $= \ln P = 21'252 - \frac{5390}{T}$

$$24'241 - \frac{6206}{T} = 21'252 - \frac{5390}{T} \rightarrow T = 273'001K = 0'001°C \text{ , } P = 4'52 mmHg$$

$\frac{\Delta_{sub}H}{R} = 6206 \rightarrow \Delta_{sub}H = 51'6 kJ/mol$ $\quad \frac{\Delta_{vap}H}{R} = 5390 \rightarrow \Delta_{vap}H = 44'81 kJ/mol$

$3\cdot10^{-3} atm \cdot 760 = 2'28 mmHg$

$$\ln 2'28 = 21'252 - \frac{5390}{T} \rightarrow T = 263'85K = -9'1°C$$

DISOLUZIOAK ARIKETAK

1. ARIKETA

$P_A^* = 1836$ Torr
$P_B^* = 354$ Torr
$P_T = 666$ Torr
ideala

$P_T = P_A^* x_A + P_B^* \cdot x_B$ $\quad x_A = 1 - x_B$

$P_T = P_A^* (1 - x_B) + P_B^* \cdot x_B$

$666 = 1836 - 1836 x_B + 354 x_B$

$1482 x_B = 1170 \rightarrow x_B = 0'79$, $x_A = 0'21$

$P_A^* x_A = P_T y_A \rightarrow 1836 \cdot 0'21 = 666 y_A \rightarrow y_A = 0'58$, $y_B = 0'42$

2. ARIKETA

$P_A^* = 172'76$ Torr

$P_T = 177'95 \rightarrow x_A = 0'99$
$x_B = 0'01$

$177'95 = 172'76 \cdot 0'99 + P_B^* \cdot 0'01 \rightarrow P_B^* = 691'76$ Torr

$P_T = 172'76 \cdot 0'98 + 691'76 \cdot 0'02 = 183'14$ Torr

$172'76 \cdot 0'99 = 177'95 y_A \rightarrow y_A = 0'96$

$172'76 \cdot 0'98 = 183'14 y_A \rightarrow y_A = 0'92$

3. ARIKETA

N_2

$y_A = 0'782$
$100_g\ H_2O$
$n\ N_2$?
$P_T = 1\ atm = 760$ Torr
$K_{N_2} = 6'51 \cdot 10^7$ Torr

$P_{N_2} = K_{N_2} \cdot x_{N_2} = P_T \cdot y_{N_2}$

$6'51 \cdot 10^7 \cdot x_{N_2} = 760 \cdot 0'782 \rightarrow x_{N_2} = 9'12 \cdot 10^{-6}$

$x_{N_2} = \dfrac{n_{N_2}}{n_{N_2} + n_{H_2O}}$

$9'13 \cdot 10^{-6} = \dfrac{n_{N_2}}{100/18} \rightarrow n_{N_2} = 5'07 \cdot 10^{-5}$ mol $= 1'42$ mg

4. ARIKETA

$P_A^* = 23'76$ Torr
2 molal $\rightarrow$ 2 mol, $1000_g\ H_2O$
$P_A = 22'75$ Torr

$P_A = P_A^* \cdot a_A = P_T \cdot y_A$

$22'75 = 23'76 \cdot a_A \rightarrow a_A = 0'9575$

$a_A = y_A \cdot x_A$

$0'9575 = y_A \cdot \dfrac{1000/18}{1000/18 + 2} \rightarrow y_A = 0'9919$

5. ARIKETA

$P_A^* = 23'76$ Torr
$P_A = 20'02$ Torr
$1000_g\ H_2O$
4'8 mol KCl $\rightarrow$ 4'8 mol K^+ + 4'8 mol Cl^-

$20'02 = 23'76\ a_A \rightarrow a_A = 0'8426$

$0'8426 = y_A \cdot \dfrac{1000/18}{1000/18 + 4'8 + 4'8} \rightarrow y_A = 0'9882$

6. Problema

$x_A = 0'2$

$x_B = 0'8$

$P_T = 304'2$ Torr

$y_A = 0'138$

$y_B = 0'862$

$P_A^* = 102'8$ Torr

$P_B^* = 295'1$ Torr

$P_A^* \cdot a_A = P_T \cdot y_A$

$102'8 \cdot a_A = 304'2 \cdot 0'138 \rightarrow a_A = 0'41$

$a_A = \gamma_A \cdot x_A \Rightarrow 0'41 = \gamma_A \cdot 0'2 \rightarrow \gamma_A = 2'041$

$295'1 \cdot a_B = 304'2 \cdot 0'862 \rightarrow a_B = 0'89$

$0'89 = \gamma_A \cdot 0'8 \rightarrow \gamma_A = 1'11$

8. Problema

$x_A = 0'68$

$x_B = 0'32$

$T_{vap\,A} = 80'1°C$

$T_{vap\,B} = 110'6°C$

$\Delta_{vap}H_A = 32'26\ kJ/mol$

$\Delta_{vap}H_B = 39'24\ kJ/mol$

$$\ln\frac{P_2}{P_1} = -\frac{\Delta_{vap}H}{R}\left(\frac{1}{T_2} - \frac{1}{T_1}\right)$$

$$\ln\frac{P_2}{760} = \frac{-32'26}{8'314\cdot10^{-3}}\left(\frac{1}{327} - \frac{1}{353'6}\right) \rightarrow P_A^* = 316'15\ mm\ Hg$$

$$\ln\frac{P_2}{760} = \frac{-39'24}{8'314\cdot10^{-3}}\left(\frac{1}{327} - \frac{1}{383'6}\right) \rightarrow P_B^* = 90'34\ mm\ Hg$$

$P_T = 316'13 \cdot 0'68 + 90'34 \cdot 0'32 = 217'85\ mm\ Hg$

9. Problema

$P_A = 1\ atm$

$0'164\ mg\ H_2 \rightarrow 8'2\cdot10^{-5}\ mol$

$1000\ g\ H_2O \rightarrow 55\ mol$

$\left.\begin{array}{l}\end{array}\right\} x_A = 1'49\cdot10^{-5}$

$P_A = 7'3\ atm$

$1 = K_A \cdot 1'49\cdot10^{-5} \rightarrow K_A = 67073'12$

$7'3 = 67073'17 x_A \rightarrow x_A = 1'09\cdot10^{-4}$

$1'09\cdot10^{-4} = \frac{n_{H_2}}{55} \rightarrow n_{H_2} = 5'98\cdot10^{-4}\ mol$

$1'197\ mm\ Hg$

11 Problema

a) $0'01\ mol\ CuSO_4$

$\left.\begin{array}{l}0'01\ mol\ CuSO_4 \rightarrow Cu^{2+} + SO_4^{2-} \\ 1000\ g\ H_2O\end{array}\right.$

$$I = \frac{1}{2}\left(0'01\cdot2^2 + 0'01\cdot2^2\right) = 0'04$$

$$\log\gamma_\pm = -0'509\cdot2\cdot1\cdot2\left(\frac{\sqrt{I}}{1+\sqrt{I}} - 0'3I\right)$$

$$\log\gamma_\pm = -0'509\cdot2\cdot2\left(\frac{\sqrt{0'04}}{1+\sqrt{0'04}} - 0'3\cdot0'04\right)$$

$\gamma_\pm = 0'484$

ÉTAUGARRI KOLIGATIBOAK. ARIKETAK.

1. ARIKETA

$0'402\,g$ n-f (A)

$26'6\,g$ KBr (B)

$\Delta Te = 0'455°C$

$Te^* = 61'7°C$

$\Delta Te = m \cdot K_e$

$0'455 = \dfrac{0'402/128'2}{26'6 \cdot 10^{-3}} K_e \rightarrow K_e = 3'86$

$3'86 = \dfrac{8'314 \cdot 10^{-3} (334'7)^2 \cdot 119'38}{\Delta_{vap}H \cdot 1000} \rightarrow \Delta_{vap}H = 28'8\ kJ/mol$

3. ARIKETA

$6\,g$ { n-f (A), antr (B) }

$300\,g$ bentz

$\Delta T_c = 0'7°C$

$K_c = 5'12\ kg/mol$

$\Delta T_c = m \cdot K_c$

$0'7 = m \cdot 5'12 \rightarrow m = 0'134\ mol/kg$

$0'134 = \dfrac{n_A + n_B}{0'3} \rightarrow 0'04 = n_A + n_B \rightarrow 0'04 = \dfrac{m_A}{128'2} + \dfrac{m_B}{178'2}$

$6 = m_A + m_B \rightarrow m_A = 6 - m_B$

$0'04 = \dfrac{6 - m_B}{128'2} + \dfrac{m_B}{178'2} \rightarrow 913'8 = 1069'2 - 178'2 m_B + 128'2 m_B$

$m_B = 3'10\,g$

$m_A = 2'89\,g$

4. ARIKETA

$4\,g\ K_2SO_4 \rightarrow 2K^+ + SO_4^{2-}$

$96\,g\ H_2O$

$\Delta T_c = 0'950K$

$K_c = 1'86\ K\,kg/mol$

$\Delta T_c = m i K_c$

$0'95 = \dfrac{4/174'27}{96 \cdot 10^{-3}} \cdot i \cdot 1'86 \rightarrow i = 2'44$

$i = 1 + \alpha(n-1)$

$2'44 = 1 + \alpha(3-1) \rightarrow \alpha = 0'57$

5. ARIKETA

$0'01m\ NH_4Cl$

$\Delta T_c = 0'0367$

$K_c = 1'86$

$\Delta T_c = m i K_c$

$0'0367 = 0'01 \cdot i \cdot 1'86 \rightarrow i = 1'97$

$i = 1 + \alpha(n-1) \rightarrow \alpha = 0'97$

$1'97 = 1 + \alpha(2-1)$

7. ARIKETA

$500\,g$ bentz.

$P_{vA}^* = 400\ Torr$

$P_{vA} = 386\ Torr$

$\Delta P_v = P_{vA}^* - P_{vA} = 400 - 386 = 14\ Torr$

$\Delta P_v = P_{vA}^* \cdot X_s \rightarrow 14 = 400 \cdot X_s \rightarrow X_s = 0'035$

$X_s = \dfrac{n_s}{n_s + n_0} \rightarrow 0'035 = \dfrac{17/M}{17/M + 500/78'1} \rightarrow M = 84'79\ g/mol$

8. ARJUETA

100 g C.H. | 4'58 g H / 1 = 4'58 mol / 3'4 = 1'34 · 3 = 4 | 40'9 g C / 12 = 3'4 mol / 3'4 = 1 · 3 = 3 | 54'5 g O / 16 = 3'4 mol / 3'4 = 1 · 3 = 3 | $(C_3H_4O_3)_n$

$T_f = -1'42°C = 271'58K$

$T_f^* = 273K$

$K_c = \frac{R(T_f^*)^2 \cdot M_{molec}}{\Delta H_f \cdot 1000} = \frac{8'314 \cdot 10^{-3} (273)^2 \cdot 18}{5'9764 \cdot 1000} = 1'86$

$T_f^* - T_f = m \cdot K_c \rightarrow 273 - 271'58 = m \cdot 1'86 \rightarrow m = 0'76$

$0'76 = \frac{n}{50'1 \cdot 10^{-3}} \rightarrow n = 0'038$

$M_{molec} = \frac{w}{n} = \frac{6'7}{0'038} = 176'32 g/mol$

$176'32 = x(3 \cdot 12 + 4 \cdot 1 + 3 \cdot 16) \rightarrow x = 2 \rightarrow C_6H_8O_6$

10. ARJUETA

$\rho = 1'017 g/mL$

$1M = \frac{1 mol\ HCl}{1L\ H_2O}$

1000 mL dis · 1'017 g/mL = 1017 g dis | 36'5 g HCl (1 mol) | 980'5 g H_2O

$0 - (-3'53) = \frac{36'5/36'5}{0'9805} \cdot i \cdot 1'86 \rightarrow i = 1'86$

$i = 1 + \alpha(n-1) \rightarrow 1'86 = 1 + \alpha(2-1) \rightarrow \alpha = 0'86 \rightarrow 86\%$

11. ARJUETA

$60 g\ H_2O$

$17 g$ sol

$\ln P = 19'173 - \frac{4886}{T}$

$4886 = \frac{\Delta H}{8'314 \cdot 10^{-3}}$

$\Delta H_{vap} = 40'62$

a) $\ln P = 19'173 - \frac{4886}{303} \rightarrow P_v^* = 36'176 mm\ Hg$

$P_v^* - P_v = P_v^* \cdot x_s$

$36'176 - P_v = 36'176 \cdot \frac{17/342}{\frac{17}{342} + \frac{60}{18}} \rightarrow P_v = 36'2 mm\ Hg$

b) $T_e - T_e^* = m \cdot K_e$

$T_e - 373 = \frac{17/342}{60 \cdot 10^{-3}} \cdot 0'51 \rightarrow T_e = 100'42°C$

$K_e = \frac{R(T_e^*)^2 \cdot M_{mol}}{\Delta H_{vap} \cdot 1000} = \frac{8'314 \cdot 10^{-3} \cdot 373^2 \cdot 18}{40'62 \cdot 1000} = 0'51$

12. ARJUETA

$0'3 mol \rightarrow 0'3 mol / 1 kg\ H_2O$

$\Pi = 10 atm$

$\alpha = 0'01$

$H_2X \rightarrow 2H^+ + X^{2-}$

$m = 0'3 \cdot 50 = 15 g$

$i = 1 + \alpha(n-1) = 1 + 0'01(4-1) = 1'03$

$\Pi = \frac{n_s}{V^0} \cdot i \cdot R \cdot T \rightarrow 10 = \frac{0'3}{V} \cdot 1'03 \cdot 0'082 \cdot 298 \rightarrow V = 0'75 L$

$\rho = \frac{m}{V} = \frac{1015}{750} = 1'36 g/mL$