

M. Zupancič

- kolokvij je pogoj za pristop k izpitu

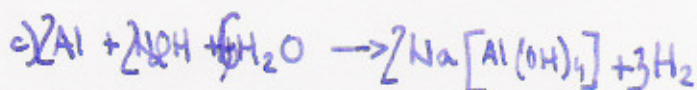
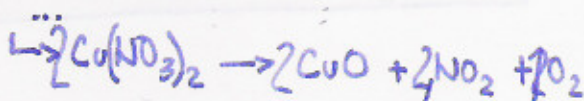
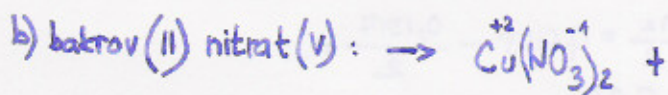
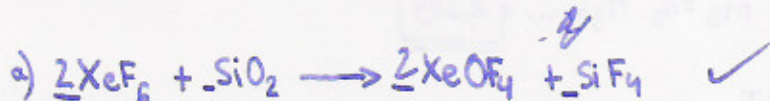
$$[A^{\circ} = 10^{-10} \text{ m}]$$

OSN. STEHOMETRIJSKI POJMI

- rel. atomska masa: $A_r(x) \rightarrow A_r(x) = \frac{m(x)}{m_e} = \frac{1}{12} \text{ mase } 12^1\text{C} = \underline{\underline{1,66 \cdot 10^{-27} \text{ kg}}}$

- rel. molek. masa: $M_r(xyz) \dots \checkmark$

vaja:



d) izračunaj masni delež $\text{Al}_2(\text{SO}_4)_3 \cdot 18\text{H}_2\text{O}$:

$$W(\text{Al}) = \frac{A_r(\text{Al}) \cdot 2}{M_r} = \dots = 0,0810$$

$$W(\text{S}) = 0,144$$

$$W(\text{O}) = 0,720$$

$$W(\text{H}) = 0,0550$$

} na tri zvevilčna mesta

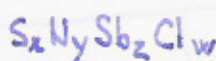
e) določi enost. formulo iz nast. spojine: masn. del:

$$W(\text{S}) = 0,150$$

$$W(\text{N}) = 0,0656$$

$$W(\text{Sb}) = 0,285$$

$$W(\text{Cl}) = 0,499$$



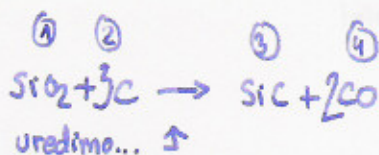
zrtamo M_r

$$x:y:z:w = \frac{W(\text{S}) \cdot M_r}{A_r(\text{S})} : \frac{W(\text{N}) \cdot M_r}{A_r(\text{N})} : \frac{W(\text{Sb}) \cdot M_r}{A_r(\text{Sb})} : \frac{W(\text{Cl}) \cdot M_r}{A_r(\text{Cl})}$$

$$x:y:z:w = 2:2:1:6$$

f) 31 $m(\text{SiO}_2) = 31 \text{ g}$
 $m(\text{C}) = 2,30 \text{ g}$

 $m(\text{SiC}) = ?$



$$n_1 = \frac{m_1}{M_1} = \frac{31 \text{ g}}{60,08 \text{ g/mol}} = 0,5158 \text{ mol}$$

$$n_2 = \frac{m_2}{M_2} = \frac{2,3 \text{ g}}{12 \text{ g/mol}} = 0,1917 \text{ mol}$$

ki bo zreagiraj

$$n_3 = \frac{n_2}{3} = \frac{0,1917 \text{ mol}}{3} = \dots$$

$$m_3 = n_3 \cdot M_3 = \dots = \boxed{2,56 \text{ g}}$$

Koliko SiO_2 bo ostalo v prebitku:

$$n_3(\text{ki bo zreagiraj}) = n_1 - \frac{n_2}{3} = 0,5158 - \frac{0,1917}{3} = \dots$$

$$m_1(\text{v prebitku}) = \dots = \underline{\underline{8,07 \text{ g}}}$$

$$\rightarrow n_1 \cdot M_1 - \frac{n_2}{3} \cdot M_1$$

splošna plinska enačba:

$$\frac{P \cdot V}{T} = \frac{P_0 \cdot V_0}{T_0}$$

[e.3.2005]

o masni delež snovi:

$$w_i = \frac{m_i}{m}$$

o Daltonov zakon o parcialnih (delnih) tlakih:

$$P = \sum P_i = P_1 + P_2 + P_3 + \dots + P_n$$

$$P_i = x_i \cdot P$$

o povprečna molska masa plinske zmesi:

$$\bar{M} = \frac{\bar{m}}{n} = \sum x_i \cdot M_i$$

$$\bar{M} = \frac{1}{\left(\sum \frac{w_i}{M_i}\right)}$$

$$x_i \cdot M_i = w_i \cdot \bar{M}$$

en način:

$$D_{\text{N}_2}^{\text{N}_2} = \frac{S_{\text{H}_2}}{S_{\text{N}_2}} = \frac{M_{\text{H}_2}}{M_{\text{N}_2}}$$

povezava med množinskim in masnim deležem:

$$x_i = \frac{n_i}{n} = \frac{m_i \cdot \bar{M}}{M_i \cdot m} = \frac{w_i \cdot \bar{M}}{M_i}$$

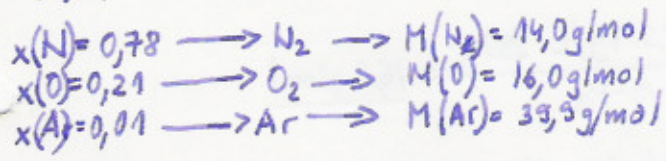
o Van der Waalsova enačba za realne pline:

$$\left(P + a \cdot \frac{n^2}{V^2}\right) \cdot (V - n \cdot b) = n \cdot R \cdot T$$

a in b sta konstanti

VAJA: Izračunaj povpr. molsko maso zraka!

$M_i = ?$



$\bar{M}(zraka) = \sum x_i \cdot M_i = (0,78 \cdot 28,0 \text{ g/mol}) + (0,21 \cdot 32,0 \text{ g/mol}) + (0,01 \cdot 39,9 \text{ g/mol})$
 $\bar{M}(zraka) = \underline{\underline{28,96 \text{ g/mol}}}$

2) Normalna gostota zmesi Ar in N je 1,33 g/L. Izračunaj parcialni tlak argona v zmesi, če je celotni $P = 8,79 \cdot 10^4 \text{ Pa}$!

$\rho_n = 1,33 \text{ g/L}$
 $P = 8,79 \cdot 10^4 \text{ Pa}$
 $\rho_n = \frac{P \cdot \bar{M}}{R \cdot T} \rightarrow \bar{M} = \frac{1,33 \text{ g/L} \cdot 8,314 \text{ J/molK} \cdot 293 \text{ K}}{101,3 \cdot 10^3 \text{ Pa}}$
 $\bar{M} = \underline{\underline{29,95 \text{ g/mol}}}$

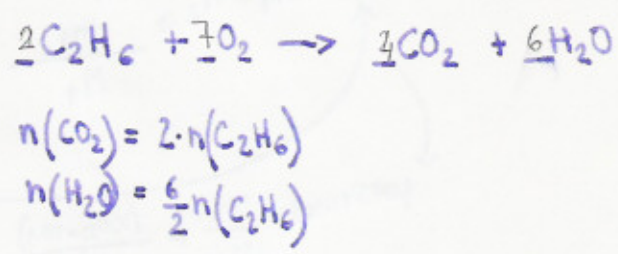
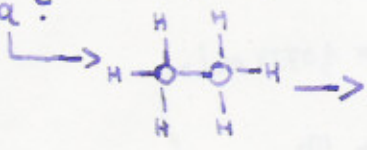
$x(Ar) = ?$
 $\bar{M} = x(Ar) \cdot M(Ar) + x(N) \cdot M(N_2)$

$p(Ar) = x(Ar) \cdot P$
 $p(Ar) = 0,164 \cdot 8,79 \cdot 10^4 \text{ Pa}$
 $p(Ar) = 1,44 \cdot 10^4 \text{ Pa}$
 $p(Ar) = \underline{\underline{1,44 \cdot 10^4 \text{ Pa}}}$

$29,95 \text{ g/mol} = x(Ar) \cdot 39,9 \text{ g/mol} + (1-x(Ar)) \cdot 28 \text{ g/mol}$
 $29,95 \text{ g/mol} = x(Ar) \cdot 39,9 \text{ g/mol} + 28 \text{ g/mol} - 28 \text{ g/mol} \cdot x(Ar)$
 $1,95 \text{ g/mol} = (39,9 \text{ g/mol} - 28 \text{ g/mol}) \cdot x(Ar)$
 $x(Ar) = \frac{1,95 \text{ g/mol}}{11,9 \text{ g/mol}} = 0,1638 = 0,164 = \underline{\underline{16,4\%}}$

3) Koliko L plinastih produktov pri $p = 98,2 \text{ kPa}$ in $T = 150^\circ \text{C}$ se razvije pri popolnem zgorevanju 10g etana?

$p = 98,2 \text{ kPa}$
 $T = 150^\circ \text{C} = 423 \text{ K}$
 $m(\text{etan}) = 10 \text{ g}$
 $M(C_2H_6) = 30 \text{ g/mol}$



$n = \frac{m}{M} = \frac{10 \text{ g/mol}}{30 \text{ g/mol}} = 0,33 \text{ mol} \cdot 5 = \underline{\underline{1,65 \text{ mol}}}$
 $V = \frac{n \cdot R \cdot T}{P} = \frac{0,33 \text{ mol} \cdot 8,314 \text{ J/molK} \cdot 423 \text{ K}}{98,2 \cdot 10^3 \text{ Pa}} = \underline{\underline{59,6 \text{ L}}}$

$$\rho(\text{HeCO}_2) = 0,657 \text{ g/lao}$$

$$T = 293 \text{ K}$$

$$P = 100 \text{ kPa}$$

$$W(\text{He}) = ?$$

$$\phi(\text{He}) = ?$$

$$p(\text{He}) = ?$$

$$p(\text{CO}_2) = ?$$

$$\bar{M} = \frac{\rho \cdot R \cdot T}{P} = \frac{0,657 \text{ g/L} \cdot 8,314 \text{ J/L} \cdot 293 \text{ K}}{100 \cdot 10^3 \text{ Pa}} = 16,0 \text{ g/mol}$$

$$\phi(\text{He}) = x(\text{He})$$

$$W(\text{He}) = \frac{x_{\text{He}} \cdot M_{\text{He}}}{\bar{M}} = \frac{0,7 \cdot \dots}{16 \text{ g/mol}} = 0,175$$

$$\bar{M} = x_{\text{He}} \cdot M_{\text{He}} + (1 - x_{\text{He}}) \cdot M_{\text{CO}_2}$$

$$x_{\text{He}} = 0,7$$

$$p(\text{He}) = x(\text{He}) \cdot P$$

$$p(\text{He}) = 0,7 \cdot 100 \cdot 10^3 \text{ Pa}$$

$$p(\text{He}) = 70 \text{ kPa}$$

$$p(\text{CO}_2) = 0,3 \cdot 100 \text{ kPa}$$

$$p(\text{CO}_2) = 30 \text{ kPa}$$

$$x_{\text{CO}_2} = 1 - x_{\text{He}}$$

$$x_{\text{CO}_2} = 0,30$$

kol bližnjica i)

$$\bar{M} = \frac{1}{\frac{W_{\text{He}}}{M_{\text{He}}} + \frac{W_{\text{CO}_2}}{M_{\text{CO}_2}}}$$

$$\phi(\text{He}) = 0,70$$

$$i) \bar{n}(\text{N}_2, \text{He}) = ?$$

$$\frac{m(\text{N}_2)}{m(\text{He})} = \frac{1}{2,5}$$

$$\bar{M} = \frac{1}{\frac{W_{\text{N}_2}}{M_{\text{N}_2}} + \frac{W_{\text{He}}}{M_{\text{He}}}} = \frac{1}{\frac{1}{3,5 \cdot 28 \text{ g/mol}} + \frac{2,5}{3,5 \cdot 4 \text{ g/mol}}} = 5,30 \text{ g/mol}$$

$$W(\text{N}_2) = \frac{1}{3,5}$$

$$W(\text{He}) = \frac{2,5}{3,5}$$

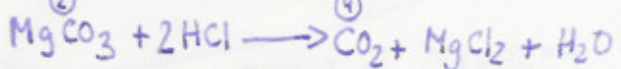
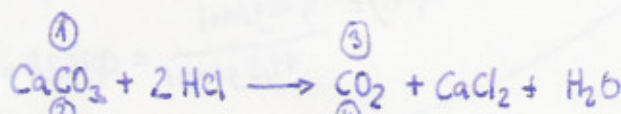
6) Pri reakciji 100g mase zmesi CaCO_3 in MgCO_3 s prebitno raztopino HCl nastane 23,6L CO_2 , merjenega pri $T = 25^\circ\text{C} = 298\text{K}$ in tlaku 112,5kPa. Izračunaj masni delež CaCO_3 v zmesi.

$$V_{\text{CO}_2} = 23,6 \text{ L}$$

$$T = 298 \text{ K}$$

$$P = 112,5 \text{ kPa}$$

$$W(\text{CaCO}_3) = ?$$



$$n_{\text{CO}_2} = n_3 + n_4 = \frac{P \cdot V_{\text{CO}_2}}{R \cdot T} = \dots = 1,0734 \text{ mol}$$

$$n_{\text{CO}_2} = n_1 + n_2 = \frac{m_1}{M_1} + \frac{m_2}{M_2}$$

$$1,0734 \text{ mol} = \frac{m_1}{M_1} + \frac{(100\text{g} - m_1)}{M_2} \dots \rightarrow m_1 = 60,4 \text{ g}$$

molarna masa
 CaCO_3

molarna masa
 MgCO_3

skopiraj si termokemijo!

datum:

[08.04.05]

masni delež topjenca: $w_{\text{toplj.}} = \frac{m(\text{topljenca})}{m(\text{raztopine})}$

molarnost - množ. koncentracija
 $c = \frac{n_z}{V_r} \left[\frac{\text{mol}}{\text{L}} = \text{M} \right]$

molalnost:
 $b = \frac{n(\text{topljenca})}{m(\text{topila})} \quad b = \frac{n_z}{m_1} \left[\frac{\text{mol}}{\text{kg}} = \text{m} \right]$

masna koncentracija:
 $\gamma = \frac{m(\text{topljenca})}{V(\text{raztopine})} \quad \gamma = \frac{m_t}{V_r} \left[\frac{\text{g}}{\text{L}} \right]$

$\gamma = c \cdot M_2$ / mešanje raztopin:
 $m_1(1) + m_2(2) = m(3)$
 $m_2(1) + m_2(2) = m_2(3)$
 $T = \text{topljenec}$
 $t = \text{topilo}$

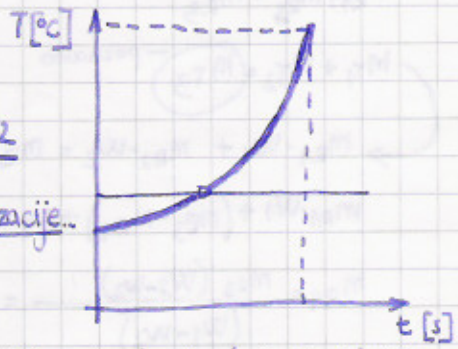
Računske naloge:

- 1) $\text{H}_2\text{O} + \text{NaCl} \longrightarrow \text{razt. NaCl}$
 $m_t + m_T = m_R$
- 2) $\text{CuSO}_4 \cdot 5\text{H}_2\text{O} + \text{H}_2\text{O} \longrightarrow \text{razt. CuSO}_4$
 $m_{KH} + m_{\text{H}_2\text{O}} = m_R$
- 3) 20% NaOH + $\text{H}_2\text{O} \longrightarrow \text{razt. NaOH}$ $w < 20\%$
- 4) 9% H_2SO_4 ...
- 5) \longrightarrow skopiraj si zapiske (Rok Žgajnar)

1.-Izračunaj!

20%
 $t(\text{KNO}_3) = \frac{32\text{g}}{100\text{g H}_2\text{O}}$

masni delež?
 $w = \frac{32,0}{132,0} = 0,242$



\rightarrow vse naloge pri topnosti so iz prekrystalizacije.

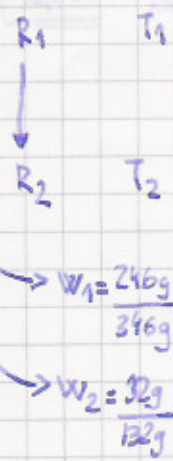
Računske naloge:

1.-koliko g KNO_3 se izloči, če $m=286\text{g}$ nasičene raztopine (pri 100°C) KNO_3 ohladimo na 20°C !

$m = 286\text{g}$
 $T_1 = 100^\circ\text{C}$
 $T_2 = 20^\circ\text{C}$

$t^{100^\circ\text{C}}(\text{KNO}_3) = \frac{246\text{g}}{100\text{g H}_2\text{O}}$
 $t^{20^\circ\text{C}}(\text{KNO}_3) = \frac{32,0\text{g}}{100\text{g H}_2\text{O}}$

$m_{\text{izloč.}}(\text{KNO}_3) = ? = X$



$m_{R1} = m_{R2} + X$
 $m_{T1} = m_{T2} + X$
 $m_t = m_t \leftarrow$ se ne spremeni!

$m_{R1} \cdot w_1 = m_{R2} \cdot w_2 + X$

$\rightarrow m_{R1} \cdot w_1 = (m_{R1} - X) \cdot w_2 + X$

$\rightarrow X = \frac{m_{R1}(w_1 - w_2)}{(1 - w_2)} = \dots = 177\text{g}$

2.- Koliko vode in koliko ^{natr.} kalijevega klorida potrebujemo za pripravo 300g raztopine?

$$\begin{aligned} m_R &= 300g \\ W &= 0,061 \text{ NaCl} \\ \hline m_{H_2O} &=? \\ m_{NaCl} &=? \end{aligned}$$

$$m_T = m_R \cdot W = 300g \cdot 0,061 = \underline{18,3g}$$

$$m_{H_2O} = 300g - 18,3g = \underline{281,7g}$$

← tak izi ne bo.)

3.- Koliko natrij. sulfata ($N_2SO_4 \cdot 10H_2O$) dekahidrata in koliko vode potrebujemo za pripravo 250g 3,5% raztopine natrij. sulfata?

$$\begin{aligned} m_R &= 250g \\ W &= 0,035 \\ \hline m_{H_2O} &=? \\ m_T &=? \end{aligned}$$

$$m_T = m_R \cdot W = 250g \cdot 0,035 = \underline{8,25g}$$

$$m_{H_2O} = \frac{m_{KH}}{M_{KH}} \cdot \frac{m_B}{M_{BS}} = \frac{8,25g \cdot 327g/mol}{142g} = \dots \rightarrow \underline{m_{KH} = 19,0g}$$

$$m_T = |8,25 - 19g| = \underline{10,75g}$$

4.- kolikšen V 20% NaOH...

$$\begin{aligned} W &= 0,20 \text{ [NaOH]} \\ S &= 1,219g/mol \\ V &= 250mL \\ C_2 &= 0,774mol \\ \hline V_1 &=? \end{aligned}$$

$$m_{T1} = m_{T2}$$

$$m_{R1} \cdot W_1 = m_{T2} \cdot M_T$$

$$S_{R1} \cdot V_1 \cdot W_1 = C_2 \cdot V_2 \cdot M_T$$

$$V_1 = \frac{0,250L \cdot 0,774mol/L \cdot 40g/mol}{1,219g/L \cdot 0,2} = \underline{31,7mL}$$

5.- (mešanje raztopin):

Radi bi pripravili 250g 13,6% raztopine H_2SO_4 iz 9,1% raztopine H_2SO_4 z gostoto 1,060g/mL in iz 20% raztopine z gostoto 1,133g/mL.

$$\begin{aligned} m_{R3} &= 250g \\ W_3 &= 0,136 \text{ } H_2SO_4 \\ W_1 &= 0,091 \\ W_2 &= 0,2 \\ \rho_1 &= 1,060g/mL \\ \rho_2 &= 1,133g/mL \end{aligned}$$

$$m_{R1} + m_{R2} = m_{R3}$$

$$m_{T1} + m_{T2} = m_{T3} \text{ - poznano}$$

$$m_{R1} \cdot W_1 + m_{R2} \cdot W_2 = m_{R3} \cdot W_3$$

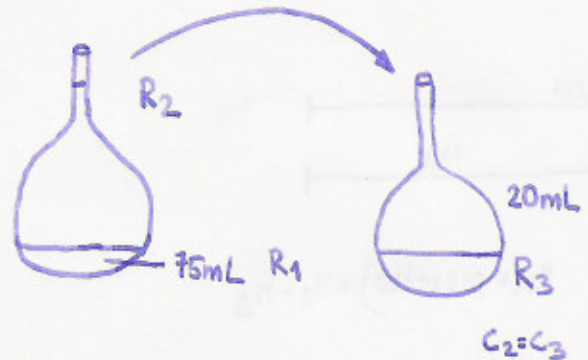
$$m_{R1} \cdot W_1 + (m_{R3} - m_{R1}) \cdot W_2 = m_{R3} \cdot W_3$$

$$m_{R1} = \frac{m_{R3} (W_3 - W_2)}{(W_1 - W_2)} = \dots = \underline{146,8g} \rightarrow V_1 = \frac{m_{R1}}{\rho_1} = 138mL$$

$$m_{R2} = m_{R3} - m_{R1} = \underline{103,2g} \rightarrow V_2 = \frac{m_{R2}}{\rho_2} = \frac{103,2g}{1,133g/mL} = \underline{90,3mL}$$

računske naloge - KEMIJA :

1) 75mL 4,20% raztopine NaOH z $\rho = 1,045 \text{ g/mL}$ razredčiš z vodo na 250mL. Pri titraciji 20mL te raztopine porabis 15,5mL raztopine H_2SO_4 . Koliko molarna je kislina?



- $V_1 = 75 \text{ mL}$
- $w_1 = 0,0420 \text{ NaOH}$
- $\rho_1 = 1,045 \text{ g/mL}$
- $V_2 = 250 \text{ mL}$
- $V_3 = 20 \text{ mL}$
- $V_4 = 15,5 \text{ mL}$

- $C_4 = ?$



$$n_3 = 2 \cdot n_4$$

$$C_3 \cdot V_3 = 2 \cdot C_4 \cdot V_4$$

$$n = \frac{m}{M} = \frac{\rho \cdot V \cdot w}{M}$$

$$n_1 = n_2$$

$$C_1 \cdot V_1 = C_2 \cdot V_2$$

$$\dots = C_2 \cdot V_2$$

$$C_2 = C_4 = \frac{1,045 \text{ g/mL} \cdot 75 \text{ mL} \cdot 0,0420 \cdot 20 \text{ mL}}{40 \text{ g/mol} \cdot 250 \text{ mL} \cdot 2 \cdot 15,5 \text{ mL}}$$

$$\frac{\rho_1 \cdot V_1 \cdot w_1}{M_1} = C_2 \cdot V_2 \rightarrow \frac{\rho_1 \cdot V_1 \cdot w_1}{M_1} = 2 \cdot C_4 \cdot V_4$$

$$C_3 = \frac{\rho_1 \cdot V_1 \cdot w_1}{M_1 \cdot V_2} = \frac{1,045 \text{ g/mL} \cdot 75 \text{ mL} \cdot 0,0420}{M(\text{NaOH}) \cdot 250 \text{ mL} \cdot 2 \cdot 15,5 \text{ mL}}$$

$$C_4 = 0,212 \text{ M}$$

2) 2,0L 4,2% NaOH z gostoto $\rho = 1,045 \text{ g/mL}$ zmešaš z 1L 3,1M raztopine KOH in razredčiš z 5L vode H_2O . Pri titraciji 100mL pripravljene raztopine porabis 98mL H_2SO_4 . Koliko je molarna ta kislina?

- $V = 2 \text{ L}$
 - $w = 0,0420$
 - $\rho = 1,045 \text{ g/mL}$
- NaOH

- $V = 1 \text{ L}$
- $C = 3,1 \text{ M}$
- $V = 5 \text{ L}$
- $V = 100 \text{ mL}$
- $V = 98 \text{ mL H}_2\text{SO}_4$

$$C_5 = ?$$

$$n_3(\text{OH}^-) = n_1 + n_2 = \frac{w_1 \cdot \rho_1 \cdot V_1}{M} + C_2 \cdot V_2$$

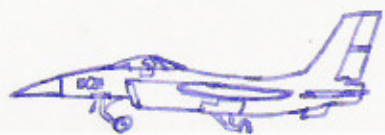
$$n_4(\text{OH}^-) = n_3(\text{OH}^-) = \frac{0,1}{5}$$

$$n(\text{H}_2\text{SO}_4) = 2 \cdot n_5 = 2 \cdot C_5 \cdot V_5$$

$$2 \cdot C_5 \cdot V_5 = \frac{0,1}{5} \cdot \left(\frac{\rho_1 \cdot V_1 \cdot w_1}{M_1} + C_2 \cdot V_2 \right)$$

$$C_5 = \frac{0,1}{5 \cdot 2 \cdot 0,098 \text{ L}} \cdot \left(\frac{0,042 \cdot 1,045 \text{ g} \cdot 2000 \text{ mL} \cdot \text{mol}}{40 \text{ g}} + 3,1 \frac{\text{mol}}{\text{L}} \right)$$

$$C_5 = 0,540 \text{ M}$$



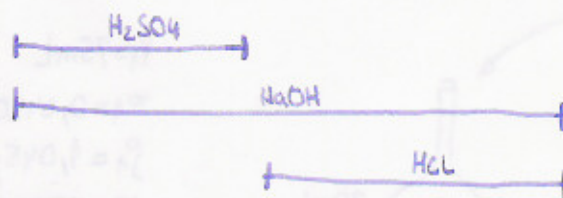
3) V vzorcu 20 mL H_2SO_4 dodamo 40,0 mL 0,400 M raztopine NaOH. Preostalo množino NaOH titriramo z raztopino HCl. Kolikšna je masa H_2SO_4 v vzorcu, če pri RETITRACIJI, porabimo 25,0 mL 0,300 M raztopino HCl?

$$V = 20,0 \text{ mL} \leftarrow H_2SO_4$$

$$V = 40,0 \text{ mL} \\ C = 0,400 \text{ M} \left. \vphantom{V = 40,0 \text{ mL}} \right\} NaOH$$

$$V = 25 \text{ mL} \\ C = 0,300 \text{ M} \left. \vphantom{V = 25 \text{ mL}} \right\} HCl$$

$$m(H_2SO_4) = ?$$



$$n_2 = C_2 \cdot V_2$$

$$n_3 = C_3 \cdot V_3$$

$$n_2(\text{v presežku}) = n_2 - n_3$$

$$n_{H_2SO_4} = 2 \cdot n_2(\text{v presežku})$$

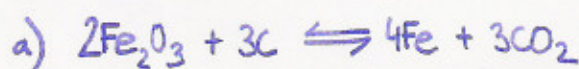
$$\frac{m_{H_2SO_4}}{M_{H_2SO_4}} = 2 \cdot (n_2 - n_3)$$

$$m_{H_2SO_4} = 2 \cdot (n_2 - n_3) \cdot M_{H_2SO_4} = 2 \cdot (C_2 \cdot V_2 - C_3 \cdot V_3) \cdot M_{H_2SO_4} = \dots$$

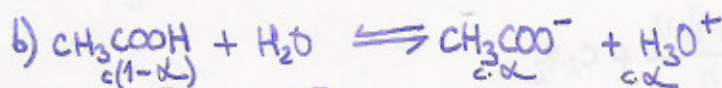
$$= 0,417 \text{ g}$$

www.fkkt.uni-lj.si - stari kolokviji!

[17.05.05]



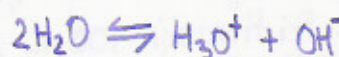
$$K = \frac{[Fe]^4 \cdot [CO_2]^3}{[Fe_2O_3]^2 \cdot [C]^3}$$



$$K = \frac{[CH_3COO^-] \cdot [H_3O^+]}{[CH_3COOH] \cdot [H_2O]}$$

$$K \cdot [H_2O] = \frac{[CH_3COO^-] \cdot [H_3O^+]}{[CH_3COOH]} = K_a$$

Ionski produkt vode in Ph:



$$K_c = \frac{[H_3O^+] \cdot [OH^-]}{[H_2O]^2}$$

$$K_w = K_c \cdot [H_2O]^2 = [H_3O^+] \cdot [OH^-] = 1 \cdot 10^{-14}$$

↳ water
↳ ionski produkt vode

VODA IN NEUTRALNE RAZTOPINE: $[H_3O^+] = [OH^-] = 10^{-7}$

KISLE RAZTOPINE: $[H_3O^+] > [OH^-]$

BAZIČNE - II -:

$$[H_3O^+] < [OH^-] \quad [H_3O^+] < 10^{-7}$$

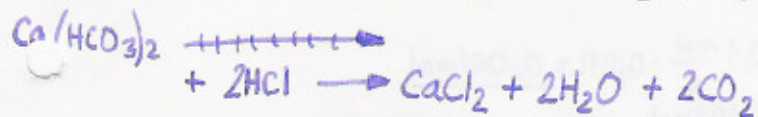
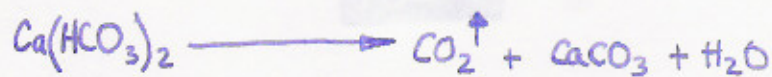
$$[H_3O^+] > 10^{-7}$$

$$pH = -\log [H_3O^+]$$

$$pOH = -\log [OH^-]$$

$$pOH + pH = 14$$

Protolitske reakcije soli...



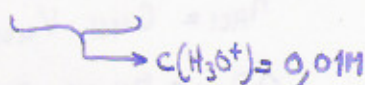
$$n_{\text{Ca}(\text{HCO}_3)_2} = n_{\text{CaO}} = \frac{m_{\text{HCl}}}{2} \cdot \frac{1}{2} = 0,1\text{M}$$
$$\frac{m_{\text{CaO}}}{M_{\text{CaO}}} = \frac{C_{\text{HCl}} \cdot V_{\text{HCl}}}{2}$$

56g/mol

trdota vode:
1N° = 1mg CaO/100mL H₂O
↳ nemška stopinja

1) Izračunaj pH 0,01M HCl!

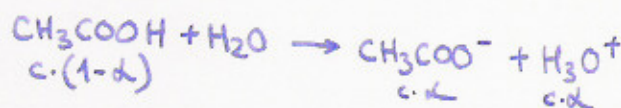
$c = 0,01\text{M}$
 $\text{pH}(\text{HCl}) = ?$



$$\text{pH} = -\log[\text{H}_3\text{O}^+] = -\log[0,01] = \underline{2}$$

2) Izračunaj pH 0,01M CH₃COOH, stopnja disociacije je 0,72!

$\alpha = 0,72$
 $\text{pH}(\text{CH}_3\text{COOH}) = ?$
 $c = 0,01$



$$[\text{H}_3\text{O}^+] = 0,72 \cdot 0,01\text{M} = 0,0072\text{M}$$

$$\text{pH} = -\log[0,0072\text{M}] = \underline{2,14}$$

3) Izračunaj pH 0,01M Ca(OH)₂!

$c(\text{Ca}(\text{OH})_2) = 0,01\text{M}$
 $\text{pH}(\text{Ca}...) = ?$



$$\text{pOH} = -\log[2 \cdot 0,01\text{M}] = -\log[0,02\text{M}]$$

$$\text{pOH} = 1,7$$

$$\text{pH} = 14 - 1,7 = \underline{12,3}$$

4) Raztopina Al(OH)₃, pH = 8,2... izračunaj koliko molarna je raztopina!

$\text{Al}(\text{OH})_3$
 $\text{pH} = 8,2 \rightarrow \text{pOH} = 14 - 8,2 = 5,8$
 $\text{pOH} = 5,8$
 $c(\text{Al}(\text{OH})_3) = ?$



$$[\text{Al}(\text{OH})_3] = \frac{[\text{OH}^-]}{3} = \frac{1,6 \cdot 10^{-6}}{3} \text{M}$$

$5,8 = -\log[x] \rightarrow 5,8 = -\log[\text{OH}^-] \rightarrow [\text{OH}^-] = 10^{-\text{pOH}} = 10^{-5,8} = 1,6 \cdot 10^{-6} \text{ mol/L}$
dobljeno vrednost delimo = tri!

5) Izračunaj pH...

10 mL (HCl), pH=1 ;

150 mL (HCl), pH=3 ;

pH = ?

NOFX

$$V_3 = 160 \text{ mL}$$

$$n_1(\text{H}_3\text{O}^+) = C_1 \cdot V_1 = 0,1 \frac{\text{mol}}{\text{L}} \cdot 0,01 \text{ L} = 0,001 \text{ mol}$$

$$n_2(\text{H}_3\text{O}^+) = C_2 \cdot V_2 = 0,001 \frac{\text{mol}}{\text{L}} \cdot 0,150 \text{ L} = 0,00015 \text{ mol}$$

$$n_3 = n_1 + n_2 = 0,00115 \text{ mol}$$

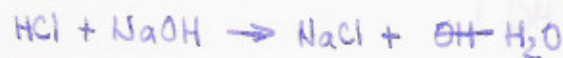
$$C_3 = \frac{n_3}{V_3} = \frac{0,00115 \text{ mol}}{0,160 \text{ L}} = 0,00719 \text{ M} \rightarrow \text{pH} = -\log 0,00719 = \boxed{2,14}$$

Izračunaj pH raztopine, ki jo dobiš z mešanjem 50 mL 0,01 M HCl in 20 mL 0,1 M NaOH. Predpostavi aditivnost volumnov!

$V_{\text{HCl}} = 50 \text{ mL}$, $C_{\text{HCl}} = 0,01 \text{ M}$;

$V_{\text{NaOH}} = 20 \text{ mL}$, $C_{\text{NaOH}} = 0,1 \text{ M}$;

pH = ?



$$n_{\text{NaOH}} = C_{\text{NaOH}} \cdot V_{\text{NaOH}} = 0,1 \text{ M} \cdot 0,02 \text{ L} = 0,002 \text{ mol}$$

$$n_{\text{HCl}} = C_{\text{HCl}} \cdot V_{\text{HCl}} = 0,01 \text{ M} \cdot 0,05 \text{ L} = 0,0005 \text{ mol}$$

$$\Delta n_{\text{OH}^-} = n_{\text{NaOH}} - n_{\text{HCl}} = 0,0015 \text{ mol}$$

$$C_{\text{OH}^-} = \frac{\Delta n_{\text{OH}^-}}{V} = \frac{0,0015 \text{ mol}}{70 \text{ mL}} \rightarrow \text{pOH} = 1,67$$

$$\text{pH} = 14 - 1,67 = \boxed{12,33}$$

$$V_3 = 20 \text{ mL} + 50 \text{ mL} = 70 \text{ mL}$$