1. a) i) H_3BO_3 – boorhape, hape

ii) $Al(OH)_3$ – alumiiniumhüdroksiid, alus

iii) Na_2O_2 – naatriumperoksiid, peroksiid

iv) LiH – liitiumhüdriid, sool

b) i) 10^6 mm = 1 km

ii) 10^3 mL = 1L

iii) 1 kg/dm^3 = 1 g/cm^3

iv) 1 g = 6,02·10^{23} amü

c) i) tugevad happed on: HI, H_2SO_4, HNO_3

ii) nõrgad happed on: H_2S, H_2SO_3, H_2SiO_3, HNO_2, H_2CO_3

d) m(Cu) = $14\,g \cdot \dfrac{417}{583}$ $\approx$ 10,0 g

m(juveelikuld) = $14\,g \cdot \dfrac{1000}{583} \approx$ 24,0 g

e) $\overset{-III\quad\ V}{NH_4NO_3} \rightleftharpoons NH_4^+ + NO_3^-$

$\qquad\qquad$ x + 4 = 1 $\qquad$ x – 6 = -1

$\qquad\qquad\qquad$ x = -3 $\qquad\qquad$ x = 5

2. a) $\dfrac{x}{100\%} \cdot 34,97 + \dfrac{100\% - x}{100\%} \cdot 36,97$ = 35,45

x · 34,97 + (100% - x) · 36,97 = 35,45 · 100%

34,97x + 36,97 · 100% - 36,97x = 35,45 · 100%

2,00x = 1,52 · 100%

x = 76,0%

%mol($^{35}_{17}$ Cl) = 76,0

%mol($^{37}_{17}$ Cl) = 100 – 76,0 = 24,0

b) m($^{35}_{17}$ Cl) = 0,760 mol · 34,97 g/mol = 26,58 g

%($^{35}_{17}$ Cl) = $\dfrac{26,58}{35,45} \cdot 100$ = 74,97 $\approx$ **75,0**

%($^{37}_{17}$ Cl) = 25,0

c) $\rho(\text{Cl}_2) = \dfrac{35,45\,\text{g}\cdot 2}{22,4\,\text{dm}^3}\cdot\dfrac{1000\,\text{dm}^3}{1\text{m}^3}\cdot\dfrac{1\text{kg}}{1000\,\text{g}} = 3,165\;\text{kg/m}^3 \approx \textbf{3,17 kg/m}^3$

3. a) $\text{MnO}_4^- + 5\text{Fe}^{2+} + 8\text{H}^+ = \text{Mn}^{2+} + 5\text{Fe}^{3+} + 4\text{H}_2\text{O}$

   VII (-) II
   $\text{Mn} + 5\text{e}^- = \text{Mn}$ | 1

   II (-) III
   $\text{Fe} - 1\text{e}^- = \text{Fe}$ | 5
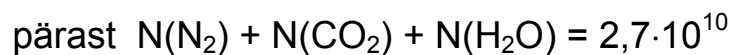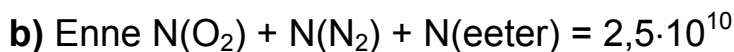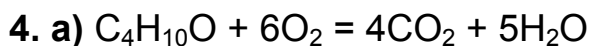
b) $5\text{Fe}^{2+} \Leftrightarrow 1\text{MnO}_4^-$
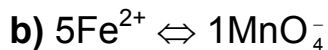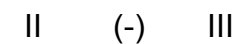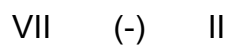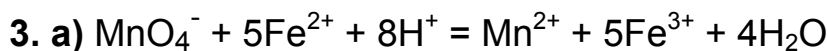
  $m(\text{Fe}^{2+}) = \dfrac{5}{1}\cdot 0,04722\,\text{L}\cdot 0,02242\,\text{mol/L}\cdot 55,85\,\text{g/mol} = 0,2956\;\text{g}$

  $\%(\text{Fe}^{2+}) = \dfrac{0,2956}{0,8040}\cdot 100 = 36,77$

c) $\text{FeO}\cdot\text{Fe}_2\text{O}_3 \Leftrightarrow \text{Fe}_3\text{O}_4$

  $5\text{Fe}_3\text{O}_4 \Leftrightarrow 15\text{Fe}^{2+} \Leftrightarrow 3\text{MnO}_4^-$
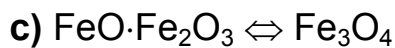
  $\textbf{\%(Fe}_3\textbf{O}_4\textbf{)} = \dfrac{5}{3}\cdot 0,04722\,\text{L}\cdot 0,02242\,\text{mol/L}\cdot 231,54\,\text{g/mol}\cdot \dfrac{1}{0,8040\,\text{g}}\cdot 100 = \textbf{50,81}$

4. a) $\text{C}_4\text{H}_{10}\text{O} + 6\text{O}_2 = 4\text{CO}_2 + 5\text{H}_2\text{O}$

  b) Enne $N(\text{O}_2) + N(\text{N}_2) + N(\text{eeter}) = 2,5\cdot 10^{10}$

   pärast $N(\text{N}_2) + N(\text{CO}_2) + N(\text{H}_2\text{O}) = 2,7\cdot 10^{10}$

  $N(\text{O}_2) = \dfrac{6}{1}N(\text{eeter})$

  $N(\text{CO}_2) = \dfrac{4}{1}N(\text{eeter})$

  $N(\text{H}_2\text{O}) = \dfrac{5}{1}N(\text{eeter})$

   (I) enne $(6+1)N(\text{eeter}) + N(\text{N}_2) = 2,5\cdot 10^{10}$

   (II) <u>pärast $(4+5)N(\text{eeter}) + N(\text{N}_2) = 2,7\cdot 10^{10}$</u> (II võrrandist lahutame I)

      $2N(\text{eeter}) = 2\cdot 10^9$

      $N(\text{eeter}) = 1\cdot 10^9$

      $N(\text{O}_2) = 6\cdot 10^9$

      $N(\text{CO}_2) = 4\cdot 10^9$

      $N(\text{H}_2\text{O}) = 5\cdot 10^9$

      $N(\text{N}_2) = 25\cdot 10^9 - 6\cdot 10^9 - 1\cdot 10^9 = 18\cdot 10^9$

i) enne   **%mol(eeter)** = $\frac{1}{25} \cdot 100$ = **4**

%mol(O$_2$) = $\frac{6}{25} \cdot 100$ = **24**

%mol(N$_2$) = $\frac{18}{25} \cdot 100$ = **72**

ii) pärast   **%mol(N$_2$)** = $\frac{18}{27} \cdot 100$ = **67**

%mol(H$_2$O) = $\frac{5}{27} \cdot 100$ ≈ **18**

%mol(CO$_2$) = $\frac{4}{27} \cdot 100$ = 14,8 ≈**15**

5. ^{0}t

a) $Ca(HCO_3)_2 = CaCO_3{\downarrow} + CO_2{\uparrow} + H_2O$

b) $Ca(HCO_3)_2 + Ca(OH)_2 = 2CaCO_3{\downarrow} + 2H_2O$

$Ca(OH)_2 + Na_2CO_3 = CaCO_3{\downarrow} + 2NaOH$

$CaSO_4 + Na_2CO_3 = CaCO_3{\downarrow} + Na_2SO_4$

c) atomaarne hapnik

d) $Al_2(SO_4)_3 + 3Ca(HCO_3)_2 = 2Al(OH)_3{\downarrow} + 3CaSO_4 + 6CO_2{\uparrow}$
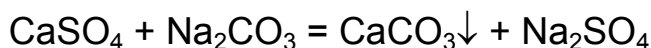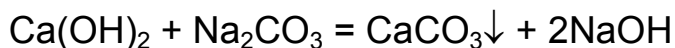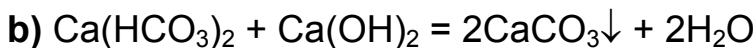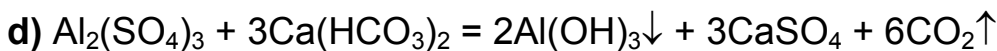
e) Koheval $Al(OH)_3$ sademel on suur eripind ja seetõttu suur adsorptsioonivõime.

f) m[Al$_2$(SO$_4$)$_3$] = 100 m^3 · 1020 kg/m^3 · 1,00·10^{-5} = 1,02 kg

M[Al$_2$(SO$_4$)$_3$·18H$_2$O] = 666 g/mol

M[Al$_2$(SO$_4$)$_3$] = 342 g/mol

m[Al$_2$(SO$_4$)$_3$·18H$_2$O] = 1,02 kg $\cdot \frac{666}{342}$ = 1,986 kg ≈ **1,99 kg**

6. a) m(100%) = 1000 cm^3· 0,4 · 0,78927 g/cm^3 = 315,708 g

m(40%vol) = 1000 cm^3 · 0,9480 g/cm^3 = 948,0 g

Tähelepanu: Kümnendiku grammi täpsus

V(H$_2$O) = 948,0 g – 315,708 g) $\cdot \frac{1 cm^3}{0,99823\,g}$ = 633,4 cm^3

Kontraktsioon = 1000 cm^3 – 400 cm^3 – 633,4 cm^3 = -33,4 cm^3

b) V(96,2%vol) = 1000 cm^3 · 0,4 $\cdot \frac{1}{0,962}$ = 415,8 cm^3

m(96,2%vol) = 1000 cm^3 · 0,4 $\frac{1}{0,962}$ · 0,80608 g/cm^3 = 335,17 g

$V(H_2O) = (948,0 \text{ g} - 335,17\text{g}) \cdot \dfrac{1\,\text{cm}^3}{0,99823\,\text{g}} = 613,9 \text{ cm}^3$

Kontraktsioon = $1000 \text{ cm}^3 - 415,8 \text{ cm}^3 - 613,9 \text{ cm}^3 = -29,7 \text{ cm}^3$