**2011/2012 õ.a. keemiaolümpiaadi lõppvooru ülesannete lahendused**

## 11. klass

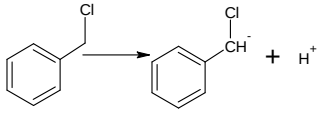
1.

a) $HF = H^+ + F^-$ $\Delta_rG°4 = \Delta_rG°1 + \Delta_rG°3 + \Delta_rG°2 = 1\,530$ kJ/mol

b) K = [HF]*[C7H6Cl-]/[F-]*[C7H7Cl] = 1^2/1,832^2= 0,298

ΔΔG=-RTlnK = 3 kJ/mol

c)




$\Delta_rG°5 = \Delta_rG°4 - \Delta\Delta G = 1527$ kJ/mol

Bensüülkloriid on tugevam hape.

d) Suurema happelisuste vahe korral on tasakaalulises ioonide segus tühine hulk üht iooni ning ioonide suhte määramatus muutub liialt suureks.

Kui ΔΔG=100 kJ/mol siis lnK=-40,36, moolsuhe 1,72*10-9:1.

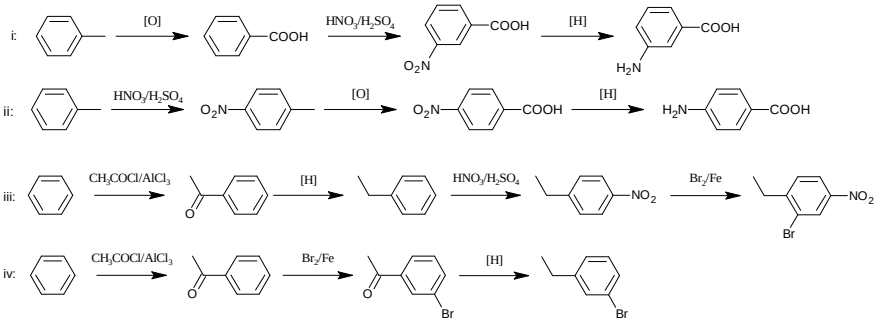
a) **2.** i: 3-aminobensoehape

ii: 4-aminobensoehape

iii: 3-bromo-4-etüülnitrobenseen

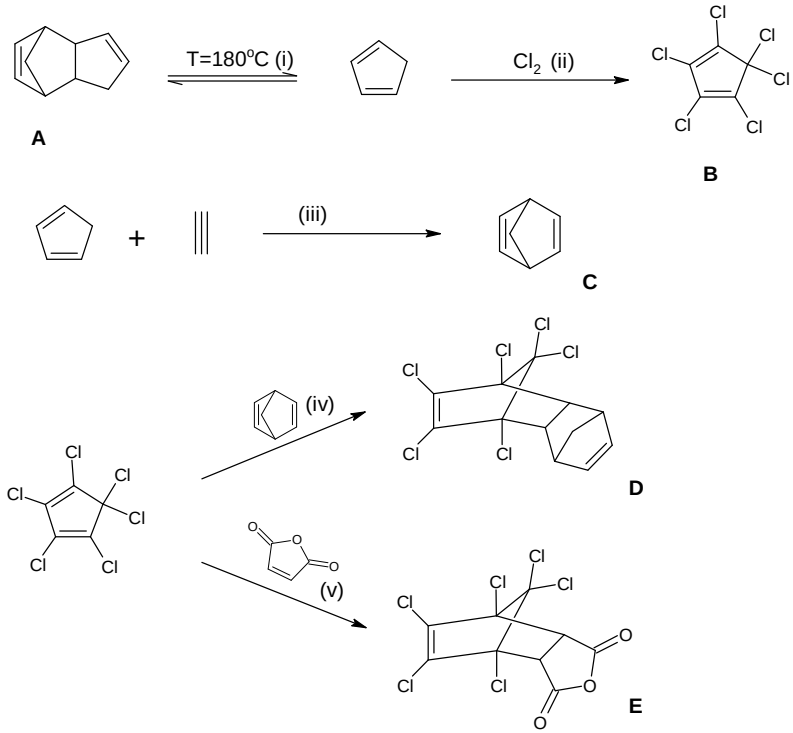
iv: 3-etüülbromobenseen

b)




c) Toluoen.

3.




4.

a) X Si

M(A)=28/0,152=184 $Na_4SiO_4$

M(Y)=12/0,238=50.5 $CH_3Cl$

b) I) B $H_4SiO_4$ ortoränihape

C $H_2SiO_3$ metaränihape

D $SiO_2$ ränidioksiid, silikageel

E SiC ränikarbiid, karborund

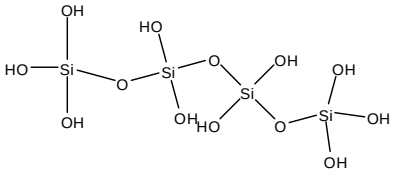
F $(CH_3)_2SiCl_2$ dimetüüldiklorosilaan

H HCl

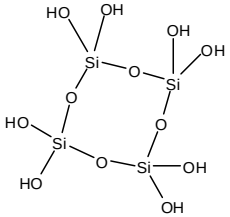
I $Cl_2$

J $SiCl_4$ ränitetrakloriid

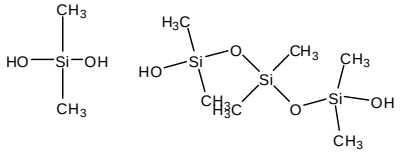
ii) tetraortoränihape $H_{10}Si_4O_{13}$



tetrametaränihape $H_8Si_4O_{12}$ $(H_2SiO_3)_4$



iii) $(CH_3)_2Si(OH)_2$



c) $Na_4SiO_4 + 4H_2O \rightarrow H_4SiO_4 + 4NaOH$

d) $Na_4SiO_4 + 3H_2O \rightarrow H_2SiO_3 + 4NaOH$

$H_4SiO_4 \rightarrow SiO_2 + 2H_2O$

$SiO_2 + C \rightarrow Si + CO_2$

$SiO_2 + 2C \rightarrow SiC + CO_2$

$Si + 2CH_3Cl \rightarrow (CH_3)_2SiCl_2$

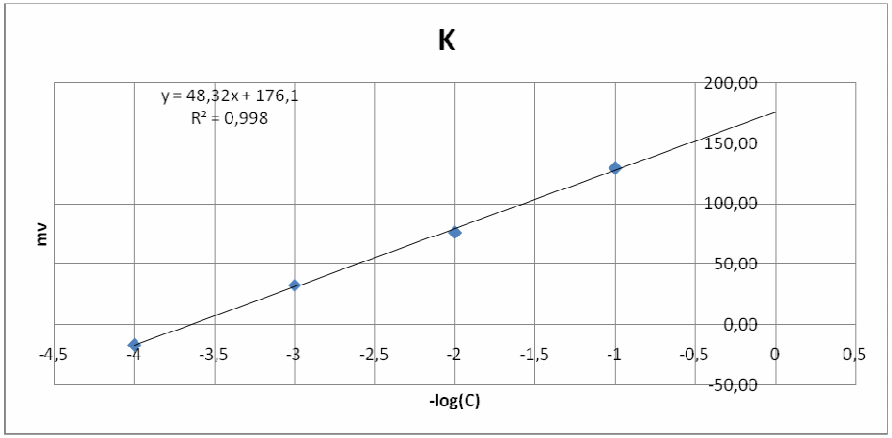
$(CH_3)_2SiCl_2 + H_2O \rightarrow (CH_3)_2Si(OH)_2$

$Si + 2Cl_2 \rightarrow SiCl_4$

**5.** a) Graafikult määratud tõus on **48 mv**

Nernsti võrrandist leitud tõus on:

$$S = \ln(10) \cdot \frac{8{,}314J}{K \cdot mol} \cdot 293K \cdot \frac{mol}{96483Q} \cdot 1000\frac{mv}{V} = 58{,}1mV$$



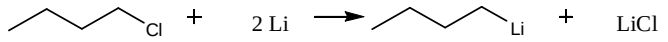

b) log(c, mineraalvesi) = -3.5 (graafikult)

c($K^+$, mineraalvees) = $10^{-3,5} \cdot 39{,}1\frac{g}{mol} \cdot \frac{1000mg}{1g}$ **=12.4 mg/l**

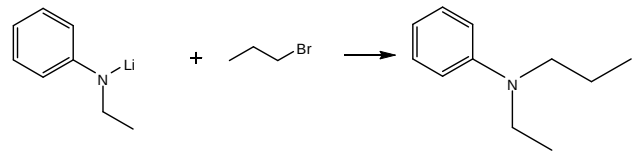
Mineraalvee kogus, milles sisaldub soovituslik kaaliumioonide päevane doos:

$$\frac{3800mg}{14\frac{mg}{l}} = 282l$$

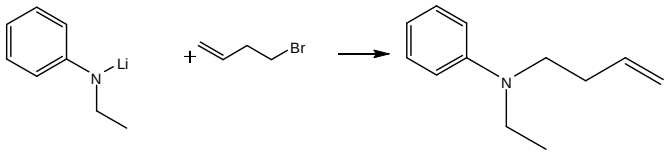
**6.** a)



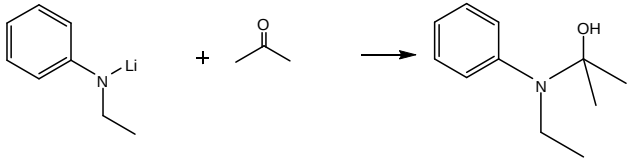

b) i)



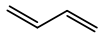

ii)




iii)

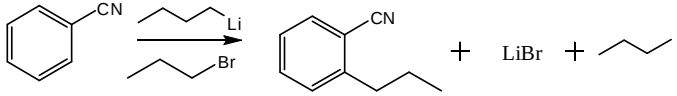



c) i)



ii) tekib konjugeeritud π-süsteem

e) i)




ii)