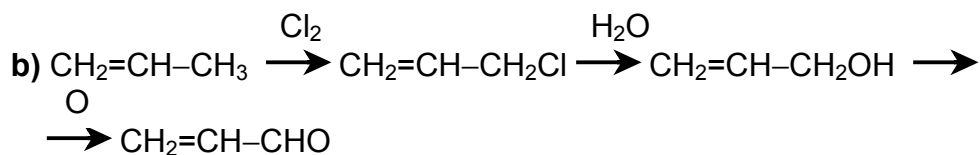
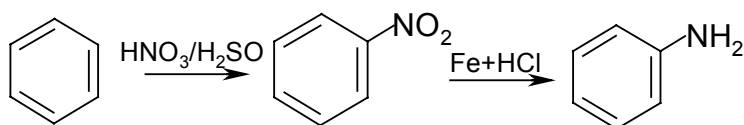
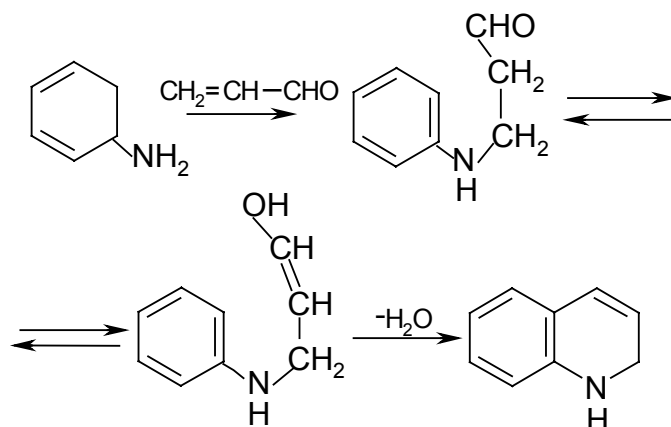


1998/99 õa keemiaolümpiaadi lõppvoorü ülesannete lahendused  
12. klass

1. a)



c)



2. a)  $K = \frac{2 \cdot 0,6}{0,1 \cdot 0,3} = 40$

b)  $\Sigma_c = 3,000 \text{ cmol/dm}^3$ ;  
 $V_{\text{alg}} = 1 \text{ dm}^3$

$$V_{\text{lõpp}} = 1 \text{ dm}^3 + \frac{0,500 \text{ cmol}}{3,000 \text{ cmol}} \cdot 1 \text{ dm}^3 = \frac{7}{6} \text{ dm}^3$$

c)  $40 = \frac{(2+x) \cdot (0,6+x)}{(0,3+0,5-x) \cdot (0,1-x)}$

d)  $[\text{NO}] = \frac{(2+x) \cdot 6}{7}$ ;  $[\text{SO}_3] = \frac{(0,6+x) \cdot 6}{7}$ ;  
 $[\text{NO}_2] = \frac{(0,1-x) \cdot 6}{7}$ ;  $[\text{SO}_2] = \frac{(0,3+0,5-x) \cdot 6}{7}$

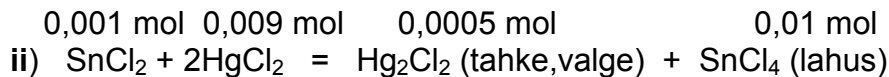
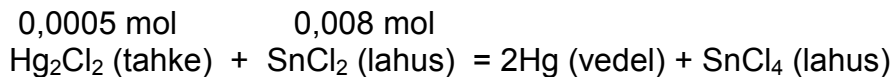
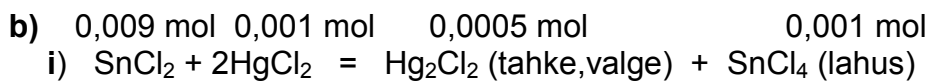
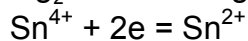
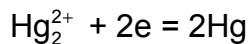
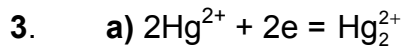
e)  $39x^2 - 38,6x + 2 = 0$ , mille positiivse väärtusega lahend on 0,055.

$$[\text{NO}] = \frac{2,055 \cdot 6}{7} = 1,761 \text{ cmol/dm}^3;$$

$$[\text{SO}_3] = \frac{0,655 \cdot 6}{7} = 0,561 \text{ cmol/dm}^3;$$

$$[\text{NO}_2] = \frac{0,045 \cdot 6}{7} = 0,039 \text{ cmol/dm}^3;$$

$$[\text{SO}_2] = \frac{0,745 \cdot 6}{7} = 0,633 \text{ cmol/dm}^3$$

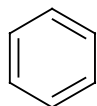


Heterogeenne reaktsioon, mis toimub tahke aine pinnal. Moodustunud elavhõbe värvib sademe tumedaks.

c) Punktis ii) jätkub redutseerijat ainult osa  $\text{Hg}_2^{2+}$  redutseerimiseks  $\text{Hg}_2^{2+}$ -ks, mis annab kloriidioonidega mittelahustuva valge kalomeli. Punktis i) redutseeritakse kogu sublimaat kalomeliks ja tina(II)kloriidi jätkub veel kalomeli redutseerimiseks elavhõbedani, mis värvib sademe tumedaks.

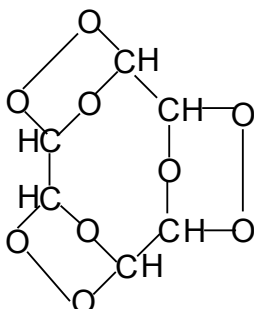
d) Standardpotentsiaalide erinevus on väike. Heterogeense reaktsioonina toimub elavhõbeda moodustumine ainult sademe pinnal.

4. a) i)



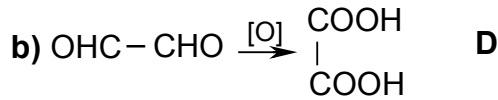
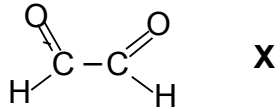
**A**

ii)

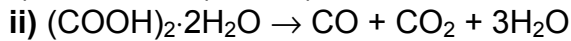
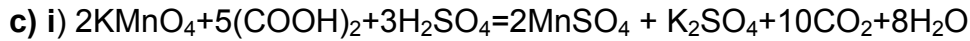


**B**

iii)



**etaandihape e oblikhape**

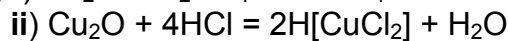
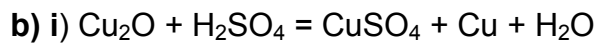
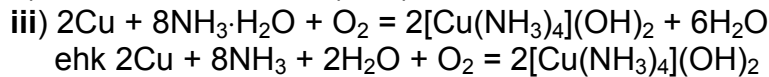
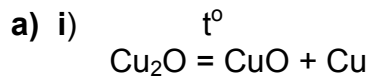


$$\text{d) i) } n(\text{COOH})_2 = \frac{5}{2} \cdot 0,01320 \text{ dm}^3 \cdot 0,02000 \text{ mol/dm}^3 \cdot 10 = 0,006600 \text{ mol}$$

$$c(\text{COOH})_2 = \frac{0,006600 \text{ mol}}{0,01000 \text{ dm}^3} = \mathbf{0,6600 \text{ mol/dm}^3}$$

$$\text{ii) } V(\text{gaasid}) = \frac{5}{1} \cdot 12,6 \text{ g} \cdot \frac{1 \text{ mol}}{126 \text{ g}} \cdot 22,4 \text{ dm}^3 / \text{mol} \cdot \frac{373\text{K}}{273\text{K}} = \mathbf{15,3 \text{ dm}^3}$$

5.



$$\text{c) i) } n(\text{HCl}) = 22,60 \text{ cm}^3 \cdot 1,19 \text{ g/cm}^3 \cdot 0,380 \cdot \frac{1 \text{ mol}}{36,5 \text{ g}} = 0,280 \text{ mol}$$

$$n(\text{Cu}_2\text{O}) = n(\text{Cu}) = 1,27 \text{ g} \cdot \frac{1 \text{ mol}}{63,5 \text{ g}} = \mathbf{0,0200 \text{ mol}}$$

$$m(\text{Cu}_2\text{O}) = 0,0200 \text{ mol} \cdot 143 \text{ g/mol} = 2,86 \text{ g}$$

HCl hulk, mis kulus  $\text{Cu}_2\text{O}$  reageerimiseks, on

$$n'(\text{HCl}) = \frac{4}{1} \cdot 0,0200 \text{ mol}$$

ii) HCl hulk, mis kulus XO reageerimiseks, on

$$n''(\text{HCl}) = 0,280 \text{ mol} - 0,080 \text{ mol} = 0,200 \text{ mol}$$

$$m(\text{XO}) = 11,00 \text{ g} - 2,86 \text{ g} = 8,14 \text{ g}$$

$$n(\text{XO}) = \frac{1}{2} \cdot 0,200 \text{ mol} = \mathbf{0,100 \text{ mol}}$$

$$\text{d) } M(\text{XO}) = 8,14 \text{ g} \cdot \frac{1}{0,100} \text{ mol} = 81,4 \text{ g/mol}$$

$$M(X) = 81,4 \text{ g/mol} - 16 \text{ g/mol} = 65,4 \text{ g/mol (Zn)}$$

