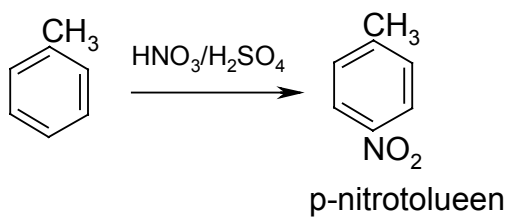
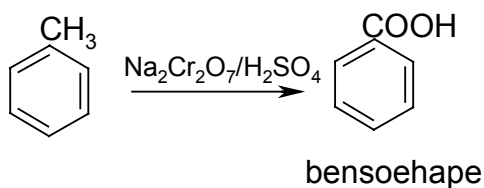


1998/99 õa keemiaolümpiaadi lõppvoorü ülesannete lahendused
11. klass

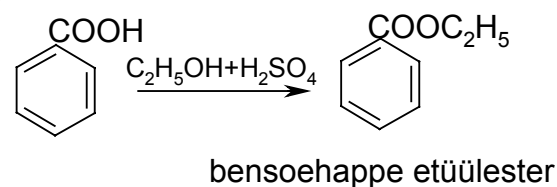
1. a) i)



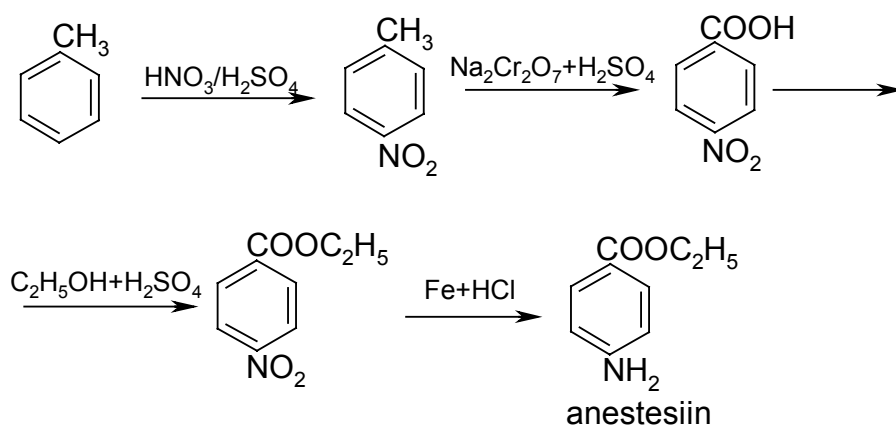
ii)



iii)



b)

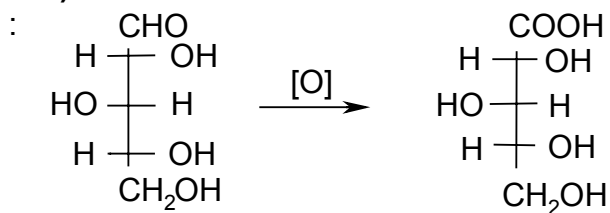


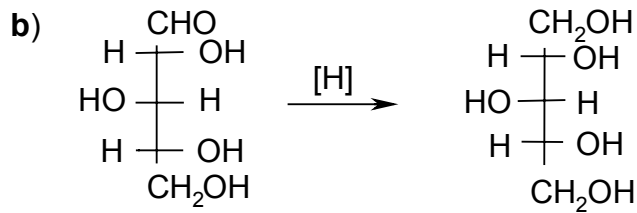
2.

a) i) D-ksüloos on tüüpiline redutseerija

ii) Seda põhjustab aldehüüdrühm

iii)



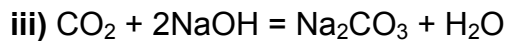
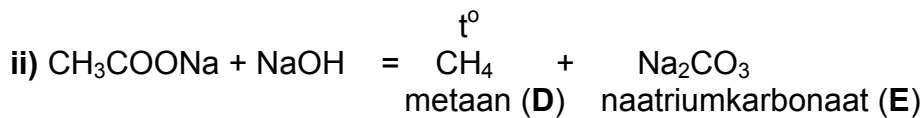


c) 1,2,3,4,5-pentaoolpentaan

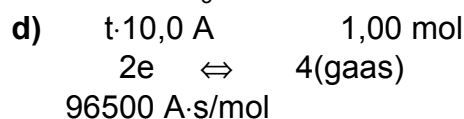
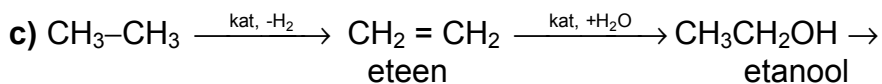
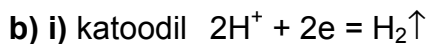
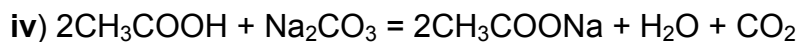


etaanhape (A)

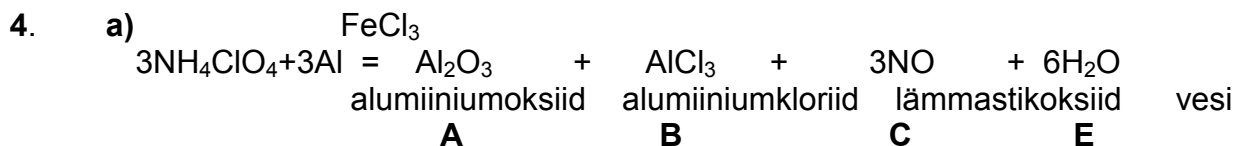
naatriummetaat (B)



G



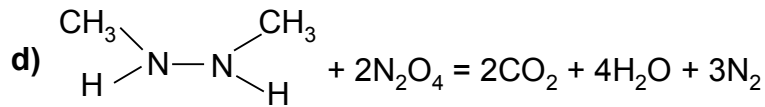
$$t = \frac{2}{4} \cdot 1,00 \text{ mol} \cdot 96500 \frac{\text{A} \cdot \text{s}}{\text{mol}} \cdot \frac{1}{10,0 \text{ A}} \cdot \frac{1 \text{ h}}{3600 \text{ s}} = 1,34 \text{ h}$$



b) $\Delta H(\text{H}_2) = 1,4 \cdot 10^3 \text{ m}^3 \cdot \frac{1000 \text{ dm}^3}{1 \text{ m}^3} \cdot 70 \text{ g/dm}^3 \cdot \frac{1 \text{ mol}}{2,0 \text{ g}} \cdot (-241 \text{ kJ/mol}) =$
 $= -1,18 \cdot 10^7 \cdot 10^3 \text{ J} \approx -1,2 \cdot 10^{10} \text{ kJ}$

c) $\Delta H(\text{butaan}) = 21,0 \frac{\text{kg}}{\text{balloon}} \cdot \frac{1000 \text{ g}}{1 \text{ kg}} \cdot \frac{1 \text{ mol}}{58,1 \text{ g}} \cdot (-2,88 \cdot 10^3 \text{ kJ/mol}) =$
 $= -1,04 \cdot 10^6 \text{ kJ/balloon}$

$$N(\text{butaan}) = \frac{-1,18 \cdot 10^{10} \text{ kJ}}{-1,04 \cdot 10^6 \text{ kJ/balloon}} = \mathbf{11000 \text{ ballooni}}$$



e) $n(\text{DMH}) = \frac{1}{3} \cdot 18 \text{ mol} = \mathbf{6 \text{ mol}}$

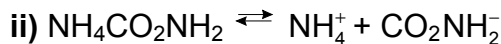
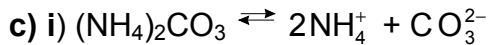
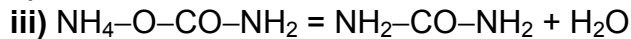
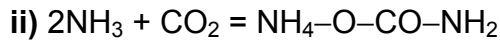
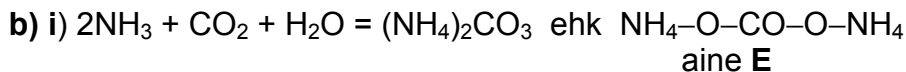
5. a) i) $\Delta T = m(\text{G}) \cdot K_{\text{kr}}$

$$m(\text{G}) = \frac{6,00 \text{ g}}{M(\text{G})} \cdot \frac{1}{0,100 \text{ kg}}$$

$$\frac{1,86\text{K}}{1,86\text{K} \cdot \text{kg/mol}} = \frac{6,00 \text{ g}}{M(\text{G}) \cdot 0,100 \text{ kg}}$$

$$M(\text{G}) = \frac{6,00 \text{ g}}{0,100 \text{ kg}} \cdot 1 \frac{\text{kg}}{\text{mol}} = \mathbf{60,0 \text{ g/mol}}$$

ii) **G** on $\text{NH}_2\text{--CO--NH}_2$, karbamiid

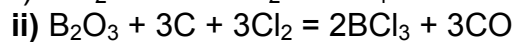
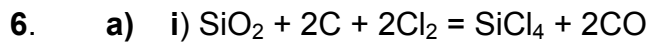


d) **A** – NH_3 , ammoniaak

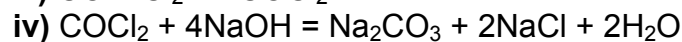
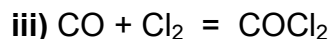
B – CO_2 , süsinikdioksiid

C – H_2O , vesi

D – $(\text{NH}_4)_2\text{CO}_3$, ammooniumkarbonaat



h·v



b) $n(\text{HCl}) = n(\text{NaOH}) - 4n(\text{COCl}_2) + 2n(\text{COCl}_2)$

$$\underbrace{\hspace{10em}}_{n(\text{NaOH, reageerimata})} \quad \underbrace{\hspace{10em}}_{n(\text{Na}_2\text{CO}_3)}$$

$$0,02200 \text{ mol} = 0,03000 \text{ mol} - 2n(\text{COCl}_2)$$

c) i) $2n(\text{CoCl}_2) = 0,03000 \text{ mol} - 0,02200 \text{ mol}$
 $n(\text{CoCl}_2) = \mathbf{0,00400 \text{ mol}}$

ii) $n(\text{Cl}_2) = 0,03500 \text{ mol} - 0,00400 \text{ mol} = \mathbf{0,03100 \text{ mol}}$

iii) $0,7878 \text{ g} \times \quad 0,7878 \text{ g} (100\% - x)$
 $2\text{SiO}_2 + 3\text{B}_2\text{O}_3 = 0,03100 \text{ mol} \cdot 100\%$
 $60,09 \text{ g/mol} \quad 69,62 \text{ g/mol}$

$$0,02622x + 3,3947\% - 0,03395x = 3,1000\%$$

$$0,007727x = 0,2947\%$$

$$x = 38,14\%$$

$$\%(\text{SiO}_2) = \mathbf{38,14}$$

$$\%(\text{B}_2\text{O}_3) = 100 - 38,14 = \mathbf{61,86}$$