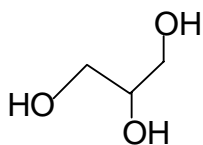


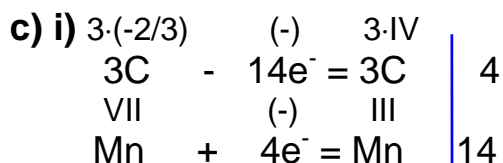
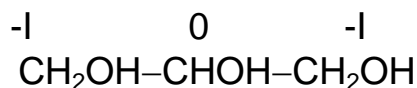
**2001/2002 õa keemiaolümpiaadi piirkonnavooru
ülesannete lahendused
12. klass**

1. a)



b) $C_3H_8O_3$

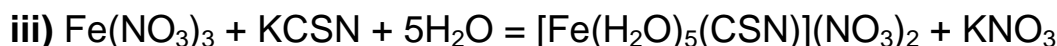
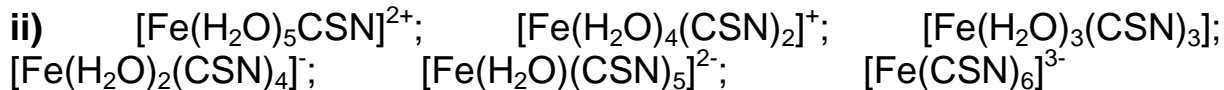
$$3x + 8 - 6 = 0 \quad x = -\frac{2}{3}$$



d) $V(C_3H_8O_3) = \frac{4}{14} \cdot 1,00 \text{ g} \cdot \frac{1 \text{ mol}}{158 \text{ g}} \cdot 92,0 \text{ g/mol} \cdot \frac{1 \text{ cm}^3}{1,26 \text{ g}} = \mathbf{0,132 \text{ cm}^3}$

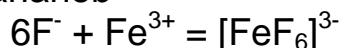
e) $V(CO_2) = \frac{5}{14} \cdot 1,00 \text{ g} \cdot \frac{1 \text{ mol}}{158 \text{ g}} \cdot 22,4 \text{ dm}^3 / \text{mol} \cdot \frac{293K}{273K} = 0,0543 \text{ dm}^3 \approx \mathbf{54,3 \text{ cm}^3}$

2. a) i) veripunane;

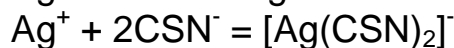
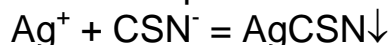


b) i) Lahus lahjeneb ja värvuse intensiivsus väheneb.

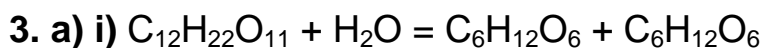
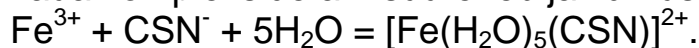
ii) Rauda värviliste komplekside arv väheneb ja värvuse intensiivsus kahaneb



iii) Rauda komplekside arv väheneb ja värvuse intensiivsus kahaneb



iv) Rauda komplekside arv suureneb ja värvuse intensiivsus suureneb



sahharoos

glükoos fruktoos

ii) aldehyüdrühm on glükoosi molekulis – aldoos (aldoosheksoos)

ketorühm on fruktoosi molekulis – ketoos (ketoosheksoos)

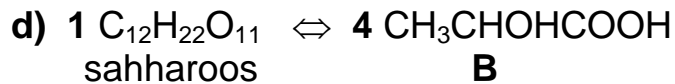


2-oksopropaanhape ehk

α -oksopropaanhape (püroviinamarihape)



ii) $V(CO_2) = \frac{12}{1} \cdot 5 \cdot 200 \text{ cm}^3 \cdot 1,017 \text{ g/cm}^3 \cdot 0,0305 \cdot \frac{1 \text{ mol}}{342 \text{ g}} \cdot 22,4 \text{ dm}^3 / \text{mol} \cdot \frac{293\text{K}}{273\text{K}} = 26,16 \text{ dm}^3 \approx \mathbf{26,2 \text{ dm}^3}$



$n(CH_3CHOHCOOH) = \frac{4}{1} \cdot 5 \cdot 200 \text{ cm}^3 \cdot 1,017 \text{ g/cm}^3 \cdot 0,0305 \cdot \frac{1 \text{ mol}}{342 \text{ g}} = 0,3628 \text{ mol}$

$c(CH_3CHOHCOOH) = \frac{0,3628 \text{ mol}}{7,50 \text{ dm}^3} = 0,04837 \text{ mol/dm}^3$

$[H^+] = \sqrt{1,38 \cdot 10^{-4} \cdot 0,04837} = 0,002584 \text{ mol/dm}^3$

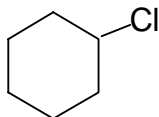
pH = -lg 0,002584 = 2,59

4. a) i) $M_r(B) = 35,45 \cdot \frac{1}{0,299} = 118,6 \text{ g}$

$N(C) = 118,6 \cdot 0,608 \cdot \frac{1}{12} = 6$

$N(H) = 118,6 \cdot (1 - 0,608 - 0,299) \cdot \frac{1}{1} = 11$

B – $C_6H_{11}Cl$. Et süsiniku aatomite vahel on ainult σ -sidemed, siis see ühend peab olema tsükliline.



ii) $M(E) = 80,07 \text{ g/mol} \cdot 1,455 = 116,5 \text{ g/mol}$ $M_r(E) = 116,5$

$\%(\text{Cl}) + \%(S) + \%(O) = 30,43 + 27,52 + 41,19 = 99,14$

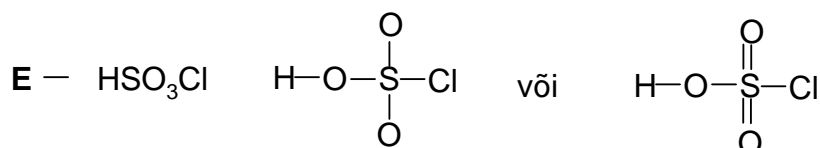
Puuduv 0,86% kuulub vesinikule (kloroväävelhape)

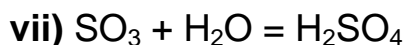
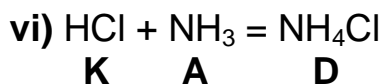
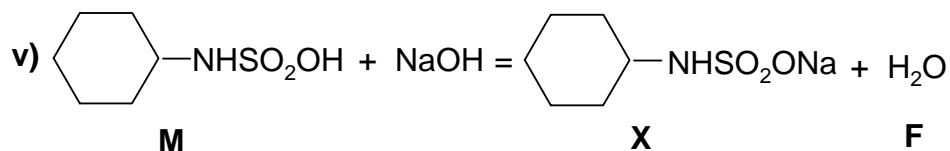
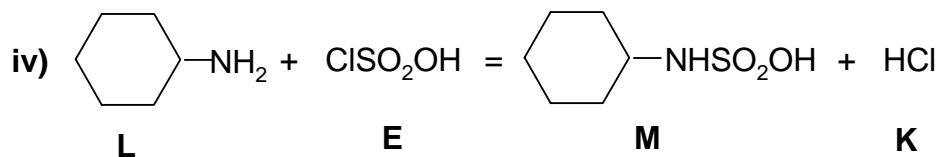
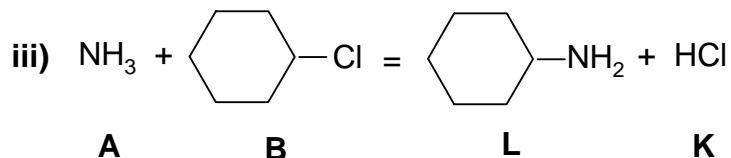
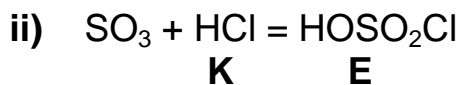
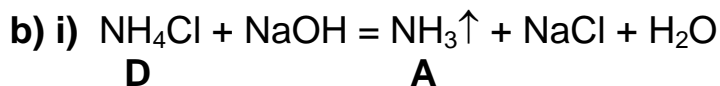
$N(H) = 116,5 \cdot 0,0086 \cdot \frac{1}{1} = 1$

$N(Cl) = 116,5 \cdot 0,3043 \cdot \frac{1}{35,45} = 1$

$N(S) = 116,5 \cdot 0,2752 \cdot \frac{1}{32,07} = 1$

$N(O) = 116,5 \cdot 0,4119 \cdot \frac{1}{16,0} = 3$





- c) **A** – NH_3 , ammoniaak
D – NH_4Cl , ammooniumkloriid
K – HCl , vesinikkloriid
F – H_2O , vesi

5. Lahustunud aineks on väävelhape ja üheks ülesande lahendamise võimaluseks on protsentarvutus lahendusvalemi järgi.

x – võetud ooleumi mass

(480 g - x) – võetud 60,0% väävelhappe mass

$$\frac{m(\text{H}_2\text{SO}_4)}{m(\text{SO}_3)} = \frac{98,1}{80,1} = 1,225 - \text{üleminekutegur ooleumis sisaldunud "vaba SO}_3\text{"}$$

massilt moodustunud H_2SO_4 massile

$$0,900 = \frac{x \cdot 0,100 \cdot 1,225 + x \cdot 0,9 + (480 \text{ g} - x) \cdot 0,600}{480 \text{ g}}$$

$$432 \text{ g} = 0,1225x + 0,900x + 288 \text{ g} - 0,600x$$

$$0,4225x = 144 \text{ g}$$

$$x = 340,8 \text{ g} \approx 341 \text{ g}$$

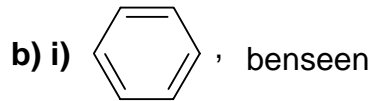
$$\mathbf{m(\text{ooleum}) = 341 \text{ g}}$$

$$\mathbf{m(60\% \text{ H}_2\text{SO}_4) = 480 \text{ g} - 341 \text{ g} = 139 \text{ g}}$$

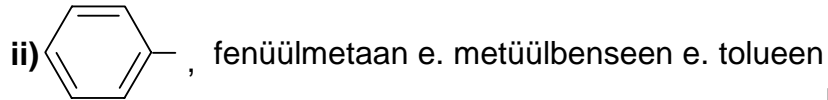




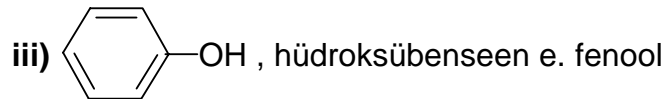
iii) aktiivsem on NO_2^+ , mis on tugevam elektrofiil



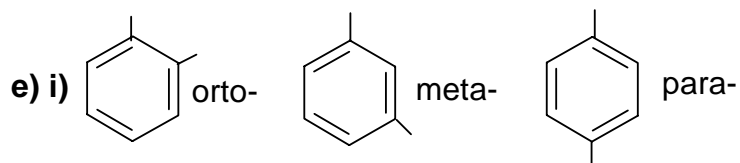
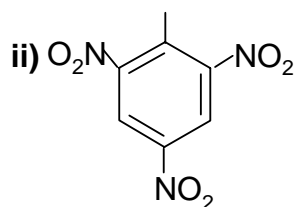
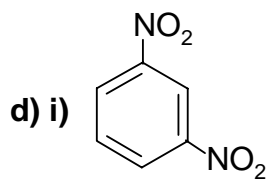
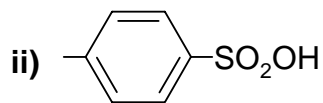
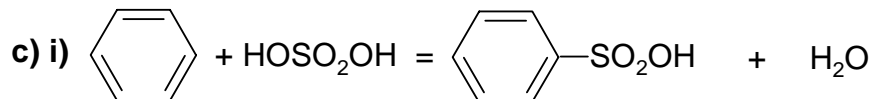
A



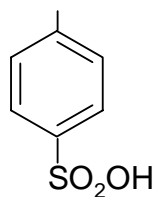
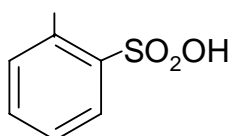
B



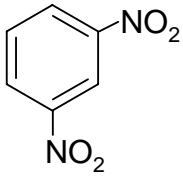
C



ii) kas orto- või para-asend



iii) meta-asend



f) **H₂O** Vett ei tohi valada väävelhappesse, seda enam ei tohi valada vett ooleumisse!