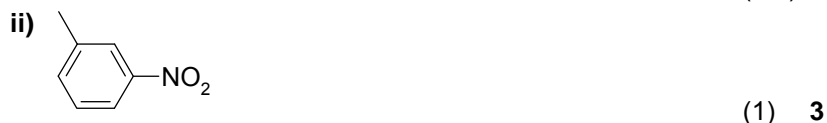
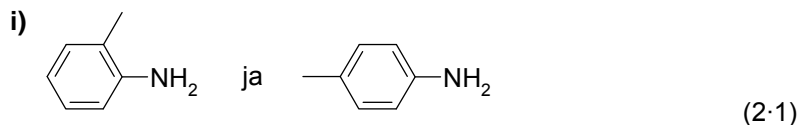


2009/2010 õ.a. keemiaolümpiaadi piirkonnavooru ülesannete lahendused

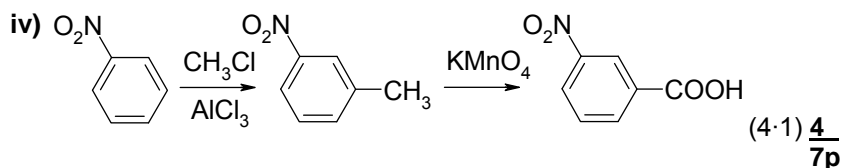
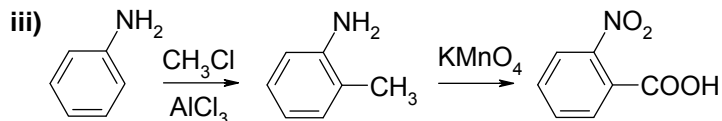
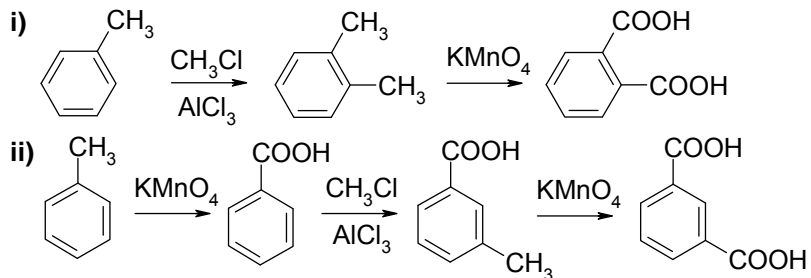
12. klass

1. a) i) kondenseerumine, põlemine, happe/aluse neutralisatsioon (3·0,5)
 ii) kristallivõre lõhkumine, sulamine (2·0,5) **2,5**
 b) i) Fe, K₂CO₃, Al(OH)₃, AgNO₃, Na₂S (5·0,5)
 ii) Zn(NO₃)₂, H₃PO₄, AgNO₃, Al(OH)₃ (4·0,5)
 iii) Fe, K₂CO₃, AgNO₃, Na₂S (4·0,5) **6,5**
 c) CH₃NH₂, CH₃ONa (2·0,75) **1,5**
 d) CH₃CH₂OH, In(NO₃)₃, RbOH (3·0,5) **1,5**
12 p

2. a)



b)



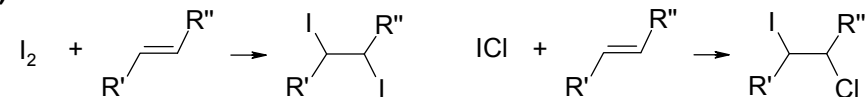
3. a) $\text{Li}_2\text{C}_2 + 2\text{H}_2\text{O} = 2\text{LiOH} + \text{C}_2\text{H}_2$ (A1 → X) $M_r = 37,9$
 $\text{Li}_4\text{C}_3 + 4\text{H}_2\text{O} = 4\text{LiOH} + \text{C}_3\text{H}_4$ (A2 → Y) $M_r = 63,8$
 $\text{Be}_2\text{C} + 4\text{H}_2\text{O} = 2\text{Be(OH)}_2 + \text{CH}_4$ (B → Z) $M_r = 30,0$
 $\text{Na}_2\text{C}_2 + 2\text{H}_2\text{O} = 2\text{NaOH} + \text{C}_2\text{H}_2$ (C → X) $M_r = 70,0$
 $\text{Mg}_2\text{C}_3 + 4\text{H}_2\text{O} = 2\text{Mg(OH)}_2 + \text{C}_3\text{H}_4$ (D → Y) $M_r = 84,6$
 $\text{Al}_4\text{C}_3 + 12\text{H}_2\text{O} = 4\text{Al(OH)}_3 + 3\text{CH}_4$ (E → Z) $M_r = 144$ (6·1)
 X – etüün, Y – propüün, Z – metaan (3·1) **9**
 b) $2\text{C}_2\text{H}_2 + 5\text{O}_2 = 4\text{CO}_2 + 2\text{H}_2\text{O}$
 $\text{C}_3\text{H}_4 + 4\text{O}_2 = 3\text{CO}_2 + 2\text{H}_2\text{O}$
 $\text{CH}_4 + 2\text{O}_2 = \text{CO}_2 + 2\text{H}_2\text{O}$ (3·1)
 Propüüni põlemisel eraldub kõige rohkem soojust. (1) **4**
13 p

4. a) $\text{CH}_4 + \text{Cl}_2 = \text{CH}_3\text{Cl} + \text{HCl}$
 $\text{CH}_4 + 2\text{Cl}_2 = \text{CH}_2\text{Cl}_2 + 2\text{HCl}$
 $\text{CH}_4 + 3\text{Cl}_2 = \text{CHCl}_3 + 3\text{HCl}$
 $\text{CH}_4 + 4\text{Cl}_2 = \text{CCl}_4 + 4\text{HCl}$ (4·1) **4**



- c) Destilleerimine
 (T_{keem} CH₃Cl: -24°C, CH₂Cl₂: 40°C, CHCl₃: 61°C, CCl₄: 77°C) **1**
8 p

5. a)



b) Kalarasv:

$$m(\text{reageeritud I}_2) = 100 \text{ g} - \frac{1}{2} \cdot \frac{1,20 \text{ mol}}{1 \text{ dm}^3} \cdot 100 \text{ cm}^3 \cdot \frac{1 \text{ dm}^3}{1000 \text{ cm}^3} \cdot \frac{254 \text{ g}}{1 \text{ mol}} = 84,8 \text{ g}$$

$$\text{I}_2 \text{ arv} = \frac{84,8 \text{ g}}{123 \text{ g}} \cdot 100 \text{ g} = 69 \text{ g} \quad (2)$$

Kalamari:

$$m(\text{reageerinud } I_2) = 100 \text{ g} - \frac{1}{1} \cdot \frac{1}{2} \cdot \frac{0,35 \text{ mol}}{1 \text{ dm}^3} \cdot 135 \text{ cm}^3 \cdot \frac{1 \text{ dm}^3}{1000 \text{ cm}^3} \cdot \frac{162 \text{ g}}{1 \text{ mol}} = 96,2 \text{ g}$$

$$I \text{ Cl arv} = \frac{96,2 \text{ g}}{47 \text{ g}} \cdot 100 \text{ g} = 204 \text{ g} = \underline{200 \text{ g}} \quad (2) \quad 4$$

c) Kuna mõlemad ained (I_2 ja ICl) reageerivad rasvhapetega üks ühele, siis:

$$n(I_2) = n(ICl) \quad (0,5)$$

Arvutus I_2 arvu kaudu:

$$I_2 \text{ arv (kalamari)} = 204 \text{ g} \cdot \frac{254}{162} = 320 \text{ g}$$

Arvutus ICl arvu kaudu:

$$ICl \text{ arv (kalarasv)} = 69 \text{ g} \cdot \frac{162}{254} = 44 \text{ g}$$

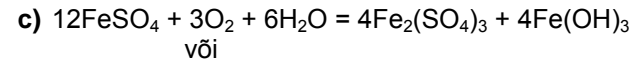
$$\frac{320 \text{ g}}{69 \text{ g}} = \frac{204 \text{ g}}{44 \text{ g}} = 4,6 \quad (2)$$

Kalamarjas on küllastamata rasvhappeid 4,6 korda rohkem kui kalas.

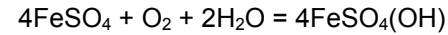
(0,5) 3
11 p

$$\%(\text{FeSO}_4) = \frac{1,721 \text{ g}}{2,000 \text{ g}} \cdot 100 = 86,1 \quad (0,5)$$

$$\%(\text{Fe}_2(\text{SO}_4)_3) = 100 - 86,1 = 13,9 \quad (0,5) \quad 3$$



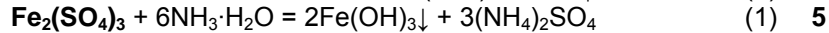
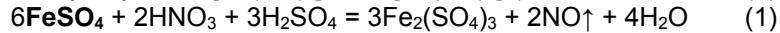
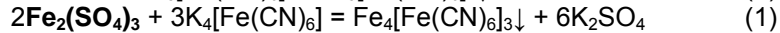
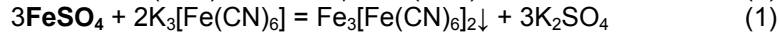
või



(Õigeks võib lugeda kõik mõistlikud redoksreaktsioonid.)

1
9 p

6. a) A – FeSO_4 B – $\text{Fe}_2(\text{SO}_4)_3$



b) $2\text{Fe}(\text{OH})_3 = \text{Fe}_2\text{O}_3 + 3\text{H}_2\text{O}$

$$n(\text{Fe}) = \frac{2}{1} \cdot \frac{1,016 \text{ g}}{159,70 \text{ g/mol}} = 0,01272 \text{ mol} \quad (1)$$

x – FeSO_4 moolide hulk

$$x \cdot \frac{151,92 \text{ g}}{\text{mol}} + 0,5 \cdot (0,01272 \text{ mol} - x) \cdot 399,91 \frac{\text{g}}{\text{mol}} = 2,000 \text{ g} \quad (1)$$

$$x = \frac{2,000 \text{ g} - 0,5 \cdot 0,01272 \cdot 399,91}{151,92 - 0,5 \cdot 399,91} \text{ mol} = \frac{-0,5442}{-48,035} \text{ mol} = 0,01133 \text{ mol}$$

$$m(\text{FeSO}_4) = 0,01133 \text{ mol} \cdot \frac{151,92 \text{ g}}{1 \text{ mol}} = 1,721 \text{ g}$$

$$m(\text{Fe}_2(\text{SO}_4)_3) = 2,000 \text{ g} - 1,721 \text{ g} = 0,279 \text{ g}$$