

**Keemiaülesaanete lahendamise lahtise võistluse  
vanema astme (11. ja 12. kl.) ülesannete lahendused  
11. novembril 1995. a.  
Tallinn, Tartu, Narva**

1. 1.  $\text{Fe}_2\text{O}_3 + 3 \text{CO} \xrightarrow{\text{kõrgahjus}} 2 \text{Fe} + 3 \text{CO}_2$
2.  $2 \text{Fe} + 3 \text{Cl}_2 \rightarrow 2 \text{FeCl}_3$
3.  $2 \text{FeCl}_3 + \text{Cu} \rightarrow \text{FeCl}_2 + \text{CuCl}_2$
4.  $\text{Fe} + 4 \text{HNO}_3 \text{ (konts.)} \xrightarrow{t^0} \text{Fe}(\text{NO}_3)_3 + \text{NO} + 2 \text{H}_2\text{O}$
5.  $\text{Fe} + 10 \text{HNO}_3 \text{ (tug. lahj.)} \rightarrow 4 \text{Fe}(\text{NO}_3)_2 + \text{NH}_4\text{NO}_3 + 3 \text{H}_2\text{O}$
6.  $\text{Fe}(\text{NO}_3)_2 + 2 \text{HNO}_3 \rightarrow \text{Fe}(\text{NO}_3)_3 + \text{NO}_2 + \text{H}_2\text{O}$
7.  $2 \text{Fe}(\text{NO}_3)_3 + 3 \text{Na}_2\text{S} \rightarrow 2 \text{FeS} + 6 \text{NaNO}_3 + \text{S}$
8.  $\text{FeS} + \text{H}_2\text{SO}_4 \text{ (lahj.)} \rightarrow \text{FeSO}_4 + \text{H}_2\text{S}$
9.  $\text{FeSO}_4 + \text{Zn} \rightarrow \text{Fe} + \text{ZnSO}_4$

2. Reaktsiooni käigus ei muutu plii oksüdatsiooniaste. Seetõttu on temas 1,750 g pliioksiidi ja  $5,016 - 1,750 = 3,266$  g pliioksiidi.

$$n(\text{PbO}_2) = 1,750 \text{g} \cdot \frac{1 \text{mol}}{239,2 \text{g}} = 0,007316 \text{mol}$$

$$n(\text{PbO}) = 3,266 \text{g} \cdot \frac{1 \text{mol}}{223,2 \text{g}} = 0,014632 \text{mol}$$

Seega on Pb(II) pliiimennikus Pb(IV)-st kaks korda rohkem, mis annab selle ühendi valemiks  $2 (\text{PbO}) \cdot 1 (\text{PbO}_2) = \text{Pb}_3\text{O}_4 = \text{Pb}_2\text{PbO}_4$  (plii(II)ortoplumbaat).



- 3.

$$\begin{array}{ccc} \text{m g} & & 0,700 \text{ cm}^3 \\ 2 \text{ KMnO}_4 & \div & 10 \text{ CO}_2 \\ 158 \text{g/mol} & & 22,4 \text{ dm}^3/\text{mol} \end{array}$$

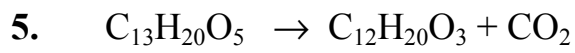
$$m (\text{KMnO}_4) = \frac{2}{10} \cdot \frac{0,700 \text{ dm}^3}{22,4 \text{ dm}^3 / \text{mol}} \cdot 158 \text{g/mol} = 0,988 \text{g}$$

$$\% (\text{KMnO}_4) = \frac{0,988}{100} \cdot 100 = 0,988\%$$

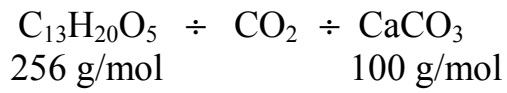
$$\begin{array}{ccc} 0,988 \text{ g} & & V \text{ cm}^3 \cdot \frac{0,500 \text{ mol}}{1000 \text{ cm}^3} \\ 2 \text{ KMnO}_4 & - & 5 (\text{COOH})_2 \\ 158 \text{ g/mol} & & \end{array}$$

$$V((\text{COOH})_2) = \frac{5}{2} \cdot \frac{0,988 \text{g}}{158 \text{g/mol}} \cdot \frac{1000 \text{ cm}^3}{0,500 \text{ mol}} = 31,3 \text{ cm}^3$$

4. a) 6 isomeeri      b) 10 isomeeri



$$5,12g \cdot \frac{p}{100} \qquad 1,80g$$



$$p_1 = \frac{1}{1} \cdot \frac{1,80g}{100g/mol} \cdot 256g/mol \cdot \frac{1}{5,12g} \cdot 100 = 90\%$$

6. Vaheaaduse nimetus on nitrobenseen.

$$p = \frac{1}{1} \cdot 0,036dm^3 \cdot 0,1mol/dm^3 \cdot \frac{1}{0,05} \cdot 78g/mol \cdot \frac{1}{10,0} \cdot 100 = 56,1\%$$