

Ülesannete lahendused*

11. klass

Tallinna XIV koolinoorte keemiaolümpiaadi koolivoor

2013/ 2014 õ.a

1. (10)

I a.

$$m(\text{NaHCO}_3)_{\text{(ei lagunenu)}} = 105\text{g} \times \frac{100\% - 96\%}{100\%} = 4,2\text{g} \quad (1)$$

b.

$$n(\text{NaHCO}_3) = \frac{105\text{g}}{84\text{g/mol}} = 1,25\text{mol} \quad (1)$$

$$n(\text{NaHCO}_3) = \frac{4,2\text{g}}{84\text{g/mol}} = 0,05\text{mol} \quad (1)$$

$$m(\text{H}_2\text{O}) = \frac{(1,25\text{mol} - 0,05\text{mol}) \times 18\text{g/mol}}{2} = 10,8\text{g} \quad (1)$$

II c.



IIId.



$$n(\text{CO}_2) = \frac{3\text{g}}{44\text{g/mol}} = 0,068\text{mol} \quad (1)$$

$$n(\text{HCl}) = 2 \times 0,068\text{mol} = 0,136\text{mol} \quad (1)$$

$$m(\text{HCl}) = 0,136\text{mol} \times 36,5\text{g/mol} = 4,96\text{g} \quad (1)$$

$$P(\text{HCl}) = \frac{4,96\text{g}}{100\text{g}} \times 100\% \sim 5\% \quad (1)$$

10p

2. (10)

a.

A – atsetüleen, B – kaltsiumoksiid, C – kaltsiumkarbonaat, D – propanoon. (iga nimetus 0,5) (2)

b.



c. Moodustunud etüün võib sellel temperatuuril laguneda: $(\text{C}_2\text{H}_2 \rightarrow 2\text{C} + \text{H}_2)$ (0,5)

$$d. m(25\text{dm}^3 \text{C}_2\text{H}_2) = \frac{25\text{dm}^3 \times 26\text{g/mol}}{22,4\text{dm}^3/\text{mol}} = 29\text{g}$$

$$m(1\text{dm}^3 \text{atsetoon}) = 1000\text{cm}^3 \times 0,790\text{g/cm}^3 = 790\text{g}$$

$$P = \frac{29 \times 100\%}{790 + 29} = 3,5\% \quad (2)$$

$$e. n(\text{C}_2\text{H}_2) = \frac{9,8 \text{ kg}}{26 \frac{\text{kg}}{\text{kmol}}} = 0,376 \text{ kmol}$$

$$V(\text{C}_2\text{H}_2) = 0,376 \text{ kmol} \times 22,4 \frac{\text{m}^3}{\text{kmol}} = 8,44 \text{ m}^3$$

$$P_v = \frac{8,44 \text{ m}^3 \times 100\%}{140 \text{ m}^3} = 6\%$$

Etüüni plahvatuspiirid on 3-82 mahuprotsenti, seega on moodustunud gaasisegu plahvatusohtlik.

(2)
10p

3. (10)



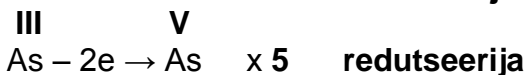
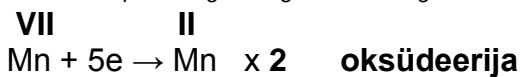
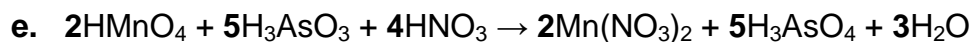
b. aluminotermia (1)

c. $m(25\% \text{ lahus}) = 500 \text{ g} \times 0,35/0,25 = 700 \text{ g}$

$$m(\text{vesi}) = 700 - 500 = 200 \text{ g}$$

$$V(\text{vesi}) = 200 \text{ g} / 1 \text{ g/cm}^3 = 200 \text{ cm}^3 = 200 \text{ ml} \quad (2)$$

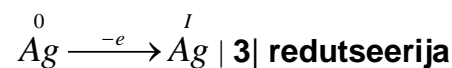
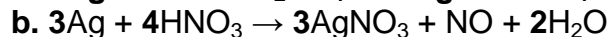
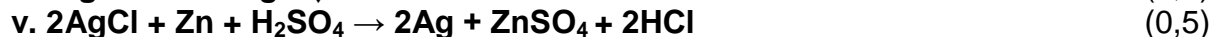
d. hõbenitraat toimib katalüsaatorina:



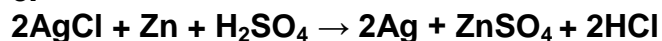
10p

4. (10)

a.



c.



$$n(\text{AgCl}) = \frac{100\text{g}}{143,5\frac{\text{g}}{\text{mol}}} \sim \mathbf{0,70\text{mol}}$$

$$n(\text{Zn}) = \frac{0,7\text{mol}}{2} = \mathbf{0,35\text{mol}}$$

$$m(\text{Zn, teoreetiline}) = 0,35\text{mol} \times 65\text{g/mol} \sim \mathbf{22,8\text{g}}$$

$$m(\text{Zn, tegelik}) = \frac{22,8\text{g} \times (100\% + 20\%)}{100\%} \sim \mathbf{27,4\text{g}} \quad (2)$$

d. Valguse toimel hõbenitraat laguneb.

(0,5)

e.

$$m(\text{Ag}) = \frac{108\frac{\text{g}}{\text{mol}} \times 95\text{g}}{143,5\frac{\text{g}}{\text{mol}}} \sim \mathbf{71,5\text{g}}$$

$$m(\text{sulam}) = \frac{71,5\text{g} \times 100\%}{85,3\%} \sim \mathbf{83,8\text{g}} \quad (2)$$

10p

*** Keemiaolümpiaadi koolivooru komisjon võib iseseisvalt hinnata võimalikke alternatiivseid lahendusvariante.**