

Ülesannete lahendused*

10. klass

Tallinna XIV koolinoorte keemiaolümpiaadi koolivoor

2013/ 2014 õ.a

1.(10)

a.



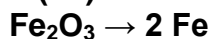
b.



c.

1 tonnis m(lisandid) = 23,6 + 17,8 + 12,0 = 53,4 kg

m(Fe) = 1000kg – 53,4kg = 946,6 kg

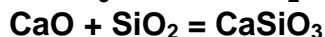


$$n(Fe) = \frac{946,6kg}{56 \frac{kg}{kmol}} = 16,9 \text{ kmol}$$

$$n(Fe_2O_3) = \frac{16,9kmol}{2} = 8,45 \text{ kmol}$$

$$m(Fe_2O_3) = 8,45kmol \times 160 \frac{kg}{kmol} = 1352 \text{ kg} \quad (2)$$

d. 1 tonnis maagis on 216 kg SiO_2



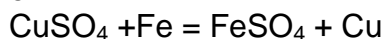
$$n(SiO_2) = \frac{216kg}{60 \frac{kg}{kmol}} = 3,6 \text{ kmol}$$

$$n(CaCO_3) = n(SiO_2) = n(CaSiO_3)$$

$$m(CaCO_3) = 3,6 \text{ kmol} \times 100 \frac{kg}{kmol} = 360 \text{ kg}$$

$$m(CaSiO_3) = 3,6 \text{ kmol} \times 116 \frac{kg}{kmol} = 417,6 \text{ kg} \quad (2)$$

e.



$$n(Cu) = \frac{0,09g}{63,5 \frac{g}{mol}} = 0,0014 \text{ mol}$$

$$m(Fe) = 0,0014mol \times 56 \frac{g}{mol} \sim 0,08 \text{ g}$$

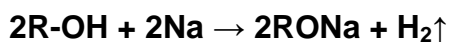
$$P(Fe) = \frac{0,08g \times 100\%}{45g} \sim 0,18\%$$

(1,5)

10p

2. (10)

1. Ühehüdroksüülsete alkoholide reaktsiooni skeem metallilise naatriumiga:



$$n H_2 = \frac{22,4 dm^3}{22,4 dm^3/mol} = 1,0 \text{ mol}$$

$$n(ROH) = 2,0 \text{ mol} \quad (1)$$

$$M_{ROH} = \frac{120g}{2mol} = 60 \text{ g/mol}$$

Ühehüdroksüülse alkoholi üldvalem: $C_nH_{2n+2}O$, kui $M = 60g/mol$, siis

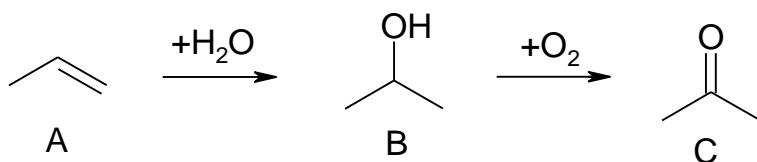
$$12 \times n + 2n + 2 + 16 = 60$$

$$n = 3$$

$$\text{Brutovalem (ROH)} = C_3H_8O \quad (2)$$



2.



(3)

A – propeen, пропен

(1)

B – propaan-2-ool, пропан-2-ол, *isopropüülalkohol*,

изопропиловый спирт

(1)

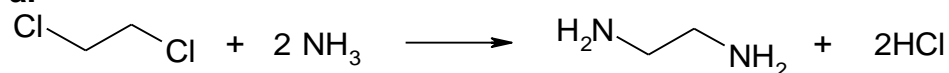
C – propanoon, пропанон, *atsetoon*, *ацетон*

(1)

10p

3. (10)

a.



(2)

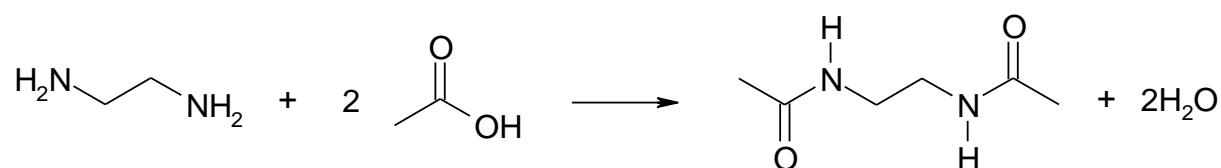
b. etaan-1,2-diamiin (1,2-diaminoetaan), *этан-1,2-диамин* (1,2-этандиамин)

(1)

c. $C_2H_8N_2$

(1)

d.



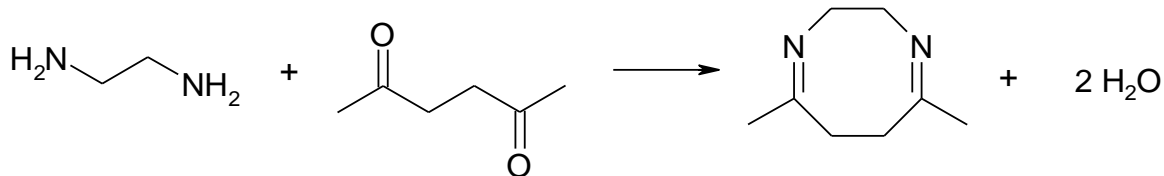
(2)

$$n(\text{CH}_3\text{COOH}) = \frac{120\text{g}}{60\frac{\text{g}}{\text{mol}}} = 2\text{ mol}$$

$$n(\text{EDA}) = 1\text{ mol} \quad (1)$$

$$m(\text{EDA}) = 1\text{ mol} \times 60\frac{\text{g}}{\text{mol}} = 60\text{g} \quad (1)$$

e.



(2)
10p

4.(10)

a.



NO_2 –lämmastikdioksiid, диоксид азота (0,5)

b.

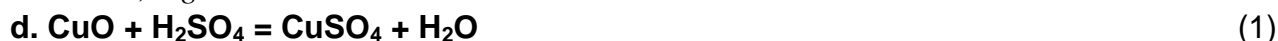


$$n(\text{CuO}) = \frac{104,3\text{g}}{79,5\frac{\text{g}}{\text{mol}}} \sim 1,31\text{mol}$$

$$m(\text{Cu}) = 1,31\text{mol} \times 63,5\frac{\text{g}}{\text{mol}} \sim 83,2\text{g}$$

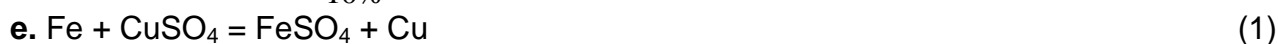
$$m(\text{Cu}) = \frac{83,2\text{g}}{12} = 6,93\text{g} \quad (1)$$

$$P(\text{Cu}) = \frac{6,93\text{g}}{7,80\text{g}} \times 100\% \sim 88,8\% \quad (1)$$



$$m(\text{H}_2\text{SO}_4) = 1,31\text{mol} \times 98\frac{\text{g}}{\text{mol}} \approx 128,4\text{g}$$

$$m(\text{H}_2\text{SO}_4)_{10\% \text{ lahust}} = \frac{128,4\text{g} \times 100\%}{10\%} = 1284\text{g} \quad (1)$$



$$m(\text{Fe}) = 1,31\text{mol} \times 56\frac{\text{g}}{\text{mol}} \sim 73,4\text{g} \quad (1)$$

f.

$$V(\text{NO}_2) = 1,31\text{mol} \times 2 \times 22,4\frac{\text{dm}^3}{\text{mol}} \sim 58,7\text{dm}^3 \quad (1)$$

10p

* Keemiaolümpiaadi koolivooru komisjon võib iseseisvalt hinnata võimalikke alternatiivseid lahendusvariante.