

**1998/99 õa keemiaolümpiaadi piirkondliku vooru
ülesannete lahendused
12. klass**

1. a) m $\quad 15,0A \cdot 0,600 \cdot 3600s$
 $Ni \quad \Leftrightarrow \quad 2e^-$
 $58,7g/mol \quad 96500 A \cdot s/mol$
 $m(Ni) = \frac{1}{2} \cdot 15,0A \cdot 0,600 \cdot 3600s \cdot \frac{1mol}{96500A \cdot s} \cdot 58,7g/mol = \mathbf{9,85 g}$

b) V $\quad 15,0A \cdot 0,400 \cdot 3600s$
 $H_2 \quad \Leftrightarrow \quad 2e^-$
 $V_M \quad 96500 A \cdot s/mol$
 $V_M = 22,4 \frac{dm^3}{mol} \cdot \frac{293}{273} \cdot \frac{760}{780} = 23,4 \frac{dm^3}{mol}$

$$V(H_2) = \frac{1}{2} \cdot 15,0A \cdot 0,400 \cdot 3600s \cdot \frac{1mol}{96500A \cdot s} \cdot 23,4 \frac{dm^3}{mol} = \mathbf{2,62 dm^3}$$

c) Lahusesse tekib Ni^{2+} ioone rohkem kui neid metallesemel redutseerub. Vesiniku eraldumisega jääb lahusesse hüdroksiidioonide liig.

d) $l(Ni) = 9,85g \cdot \frac{1cm^3}{8,9g} \cdot \frac{1}{32cm^2} = \mathbf{0,035 cm}$

2. a) $820 \text{ ööpäeva} \cdot \frac{1aasta}{365 \text{ ööpäeva}} = 2,25 \text{ aastat}$

$$K = \frac{\ln 2}{2,25 \text{ aastat}} = \mathbf{0,308 \text{ aasta}^{-1}}$$

b) $t = \frac{1aasta}{0,308} \cdot \ln \frac{1,0 \cdot 10^{-2}}{7,3 \cdot 10^{-3}} = \mathbf{1,0 \text{ aastat}}$

c) $e^{k \cdot t} = \frac{c_0}{c_t}$

$$c_t = c_0 \cdot e^{-k \cdot t} \Rightarrow 1,0 \cdot 10^{-2}\% \cdot e^{-0,308 \text{ aasta}^{-1} \cdot 1,5 \text{ aastat}} = \mathbf{2,1 \cdot 10^{-3}\%}$$

3. a) **A** – HCl; **B** – Cl₂; **D** – NaBr; **E** – Br₂ (ka I₂ on õige); **G** sisaldab NaCl, NaBr ja H₂SO₄

- b)
- 1) $MnO_2 + 4HCl = MnCl_2 + Cl_2 + 2H_2O$
 - 2) $Cl_2 + 2NaBr = 2NaCl + Br_2$
 - 3) $Br_2 + NaHSO_3 + H_2O = NaBr + H_2SO_4 + HBr$
 Õige on ka $Br_2 + NaHSO_3 + H_2O = NaHSO_4 + 2HBr$
 - 4) $H_2SO_4 + Ba(NO_3)_2 = BaSO_4 \downarrow + 2HNO_3$
 - 5) $NaCl + NaBr + H_2SO_4 + 4AgNO_3 = AgCl \downarrow + AgBr \downarrow + Ag_2SO_4 \downarrow + 2NaNO_3 + 2HNO_3$

c) Ba(NO₃)₂ lisamisel: lahuses H⁺, Na⁺, Cl⁻; Br⁻; sademes BaSO₄
 AgNO₃ lisamisel: lahuses H⁺, Na⁺, NO₃⁻; sademes AgCl, AgBr, Ag₂SO₄

4. a) $[SnSO_4] = [Sn^{2+}] = [SO_4^{2-}] = \sqrt{L(SnSO_4)}$

$$m(\text{SnSO}_4) = 0,200 \text{ dm}^3 \cdot \sqrt{2,8 \cdot 10^{-7} (\text{mol}/\text{dm}^3)^2} \cdot 215 \text{ g/mol} = \mathbf{0,023 \text{ g}}$$

b) $[\text{SO}_4^{2-}] = c(\text{Na}_2\text{SO}_4)$

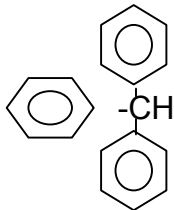
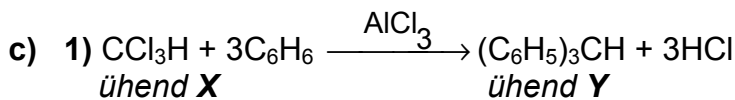
$$m(\text{Sn}^{2+}) = 1 \text{ dm}^3 \cdot \frac{2,8 \cdot 10^{-7} (\text{mol}/\text{dm}^3)^2}{0,125 \text{ mol}/\text{dm}^3} \cdot 119 \text{ g/mol} = \mathbf{0,00027 \text{ g}}$$

c) $[\text{Sn}^{2+}] = \frac{2,0 \cdot 10^{-3} \text{ g}}{119 \text{ g/mol}} \cdot \frac{1}{0,100 \text{ dm}^3} = 1,68 \cdot 10^{-4} \text{ mol}/\text{dm}^3$

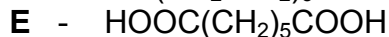
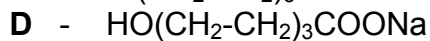
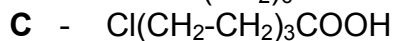
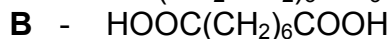
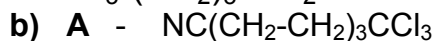
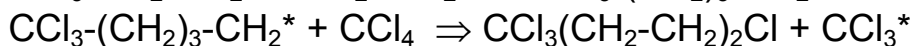
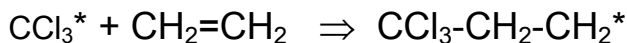
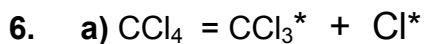
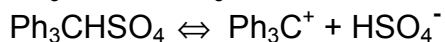
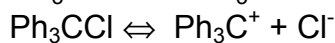
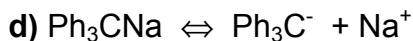
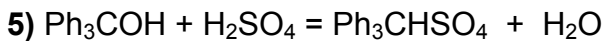
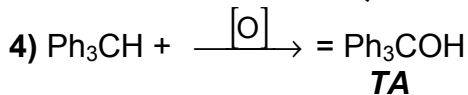
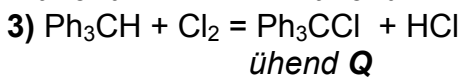
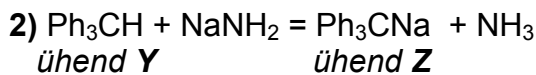
$$c(\text{H}_2\text{SO}_4) = \frac{2,8 \cdot 10^{-7} (\text{mol}/\text{dm}^3)^2}{1,68 \cdot 10^{-4} \text{ mol}/\text{dm}^3} = \mathbf{1,7 \cdot 10^{-3} \text{ mol}/\text{dm}^3}$$

5. a) Ühendiks **A** on metaan **CH₄**.

b) CCl_3H - triklorometaan; $\%(\text{Cl}) = \frac{3 \cdot 35,5}{119,5} \cdot 100 = 89,1$



trifenüülmetaan; Ph_3CH , kus Ph - fenüülradikaal.
ühend Y



c) **B** - oktaandihape

E - heptaandihape